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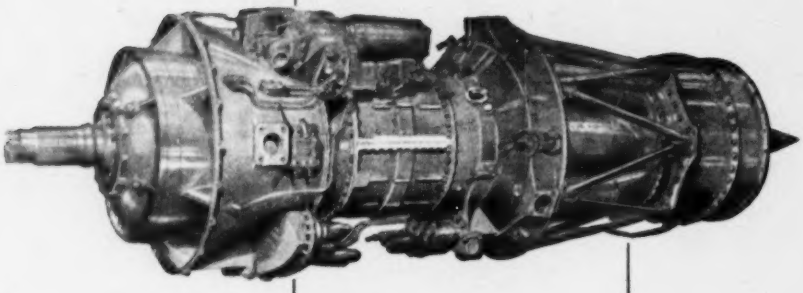

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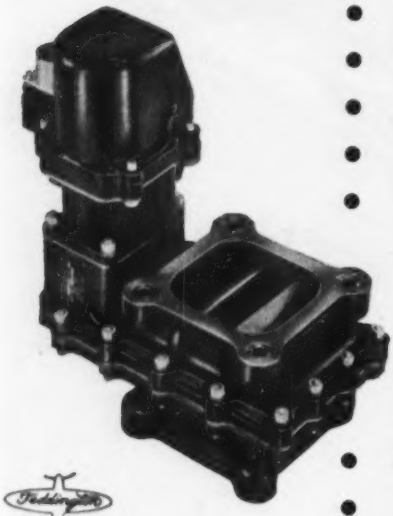

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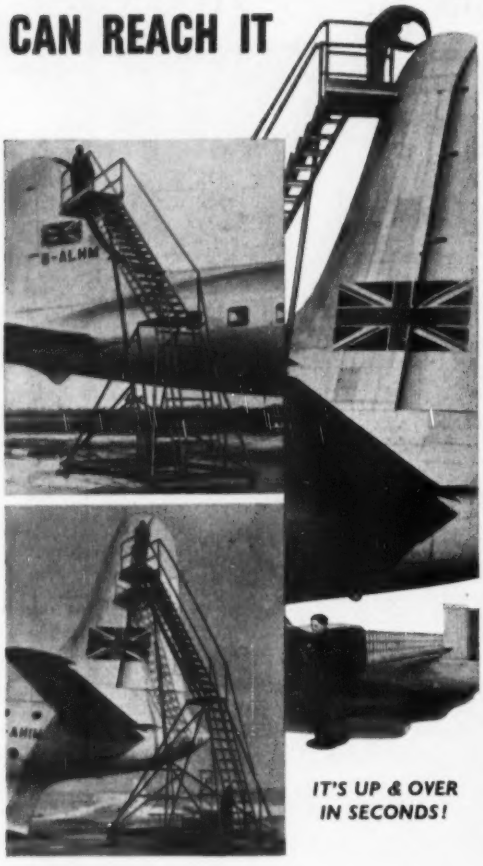

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KLM Royal Dutch Airlines have just placed their *third* successive order for Super Constellations. KLM plans to put them into service on the heavily competitive North Atlantic route, where long range and superior performance are absolutely essential to profitable operation of an airline.

Announced simultaneously was a new order for Super Constellations placed by LAV, Linea Aeropostal Venezolana. This choice is backed by their long previous experience with dependable Constellations. These orders make a total of 148 Super Constellations sold alone and brings the production line for this famous aeroplane to its greatest peak in history.

Key to the worldwide acceptance of the Super Constellation is its extreme built-in versatility and long competitive life. Carefully designed to meet changing airline traffic conditions, its seating arrangements can be quickly and easily changed *between flights* from luxury accommodation for 47 to as many as 94 passengers.

And the Super Constellation is probably the first aeroplane ever pre-designedwith sufficient structural strength to allow for a large increase in take-off weight (from present 130,000 lbs. to as much as 150,000 lbs.) without further structural modification. It is designed to utilize either Allison or Pratt & Whitney turbo-prop power plants, which will increase top speed from 379 to 449 miles per hour. The first two Super Constellations with turbo-prop power, on order for the U.S. Navy, will fly next year.

This combined adaptability and versatility is why the Constellation and Super Constellation make money for operators. They have been selected by these 20 world airlines :—

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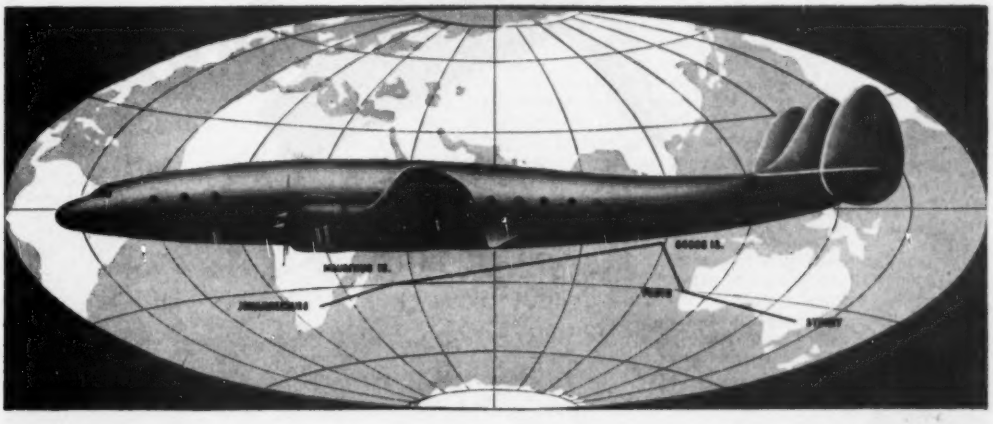

When commercial air-travel time between any two cities is cut by 4 whole days, *that's news!* This September QANTAS Empire Airways made such news with a new schedule that cuts flying time from Sydney to Johannesburg from 7½ days to 3½ days — using Lockheed Constellations.

Only 3 stops are made en route, dividing the 8,493 miles into 4 hops! 2,059 miles from Sydney to Perth, Australia; 1,832 miles from Perth to the Cocos Islands; 2,677 miles from the Cocos to Mauritius Island; and 1,925 miles from Mauritius to Johannesburg.

The 2,677-mile span from the Cocos to Mauritius is the longest over-water flight ever scheduled in commercial aviation history.

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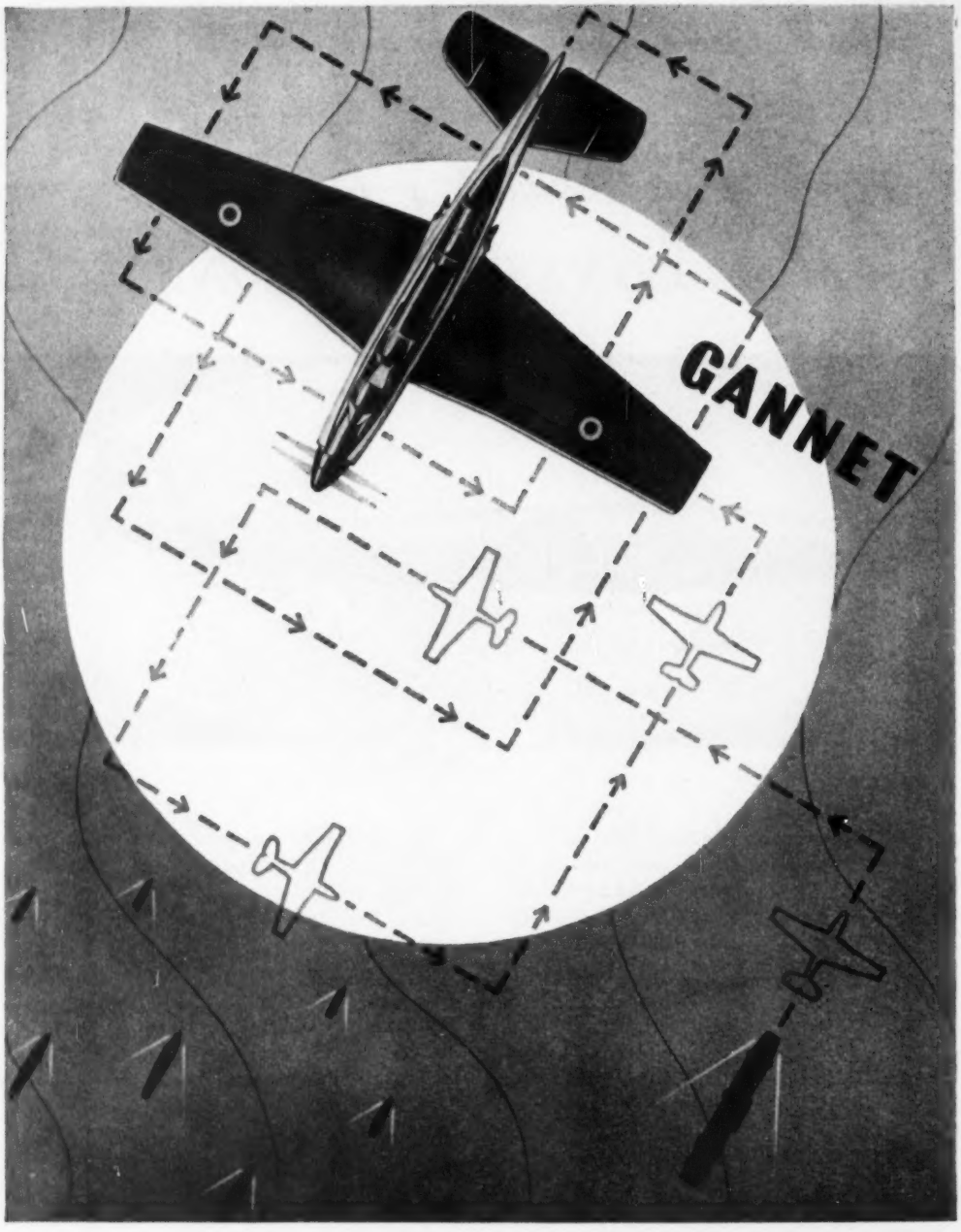

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Earlier Guidance

SOME young men are fortunate enough to have a career mapped out for them almost from birth, and are thus during their schooldays spared the unpleasant symptoms of a dawning sense of responsibility about selecting a job and providing for themselves. But how many of us at the age of 12 or 14 shuffled our feet and looked embarrassed when a well-meaning uncle asked, "What are you going to do when you grow up, my boy?" With more self-possession and experience we might well have answered, "I haven't the slightest idea, for no one has given me the sort of advice I can understand about such things as qualifications, working conditions, prospects and pay." As it was, we probably replied dully that we didn't know.

Such are the times in which we live that brains and the products resulting from their application are fast becoming the nation's most important export. Asiatic countries, and huge industrial nations like America, are bound to be able to produce some things more cheaply or more quickly than ourselves, so if we are to sell our products against such competition they must continue to be better in quality, more ingenious in design, at least comparable in price, and preferably not dependent upon the use of quantities of scarce, expensive "bought-out" materials.

These thoughts bear closely upon the subject of a most important lecture given recently in Nottingham University by Lord Hives, chairman of Rolls-Royce, Ltd., of which abstracts appear on pages 474-475. If his company—the name of which is in world-wide usage as an adjective indicative of superlative quality—engages a first-class technician, there are always (he told his audience) at least six jobs for him to do; but anxiety is felt over the quality of the average man, which, in the opinion of the company, leaves room for improvement. Earlier in the lecture Lord Hives had stated his fears lest an increase in the numbers of graduates from universities might be at the expense of quality. Already there were signs of such a shortcoming.

In our view, much more might be done to help boys at school to select, plan and prepare for their careers, not omitting a study of the possibilities of getting a good job in their chosen occupation. This, we believe, is particularly important if engineering is selected rather than the arts for, although there may be plenty of good jobs available for a first-class man, training must begin early if high standards are to be achieved. For example, applied mathematics is a subject less easily taught and learned than most others, yet it is of extreme importance to the engineer. Some people have a flair for figures, others definitely have not. But the absence of such a flair need not debar a man from engineering and should not cause his tutors to give up and suggest that he become, say, a historian.

Reverting to the earlier reference to average men, we may add that nowhere is the average a more dangerous thing than in the aircraft industry. Dr. Plesman of K.L.M. is credited, we believe, with words to the effect that no price is too high to pay for a good aeroplane, but a poor one is expensive at any figure. Just how true this is, and how important it is to have the right aircraft, has become apparent to the British public through the annual accounts of the airline Corporations.

There is no denying that in the past the aircraft industry has been somewhat unstable, but there is now good reason to believe that it is entering an entirely new phase which will enable it to offer security and good prospects to those it employs. But without a steady influx of first-class and highly qualified men from the universities, the present high standards may not be maintained. To permit a lowering of standards of design and engineering, or a reduction in the quality of the product, would be nothing short of suicidal. The future of the engineering industry, and especially of the aircraft section of it, is of extreme national importance, and the training of first-class technicians is therefore a matter for the country as a whole. Even so, this may often amount to no more than the recognition and encouragement of talent at the right time.

We commend Lord Hives' advice to fathers, their sons (and daughters), to schoolmasters and college tutors, and to executives in the aircraft industry—who in some cases could give more advice, practical help and encouragement. It clearly indicates the requirements and outlines the wisest courses to follow, while sounding a firm warning about the dangers of mediocrity.

POLAR AIR BASE

The Thule Enterprise, and What its Construction has Involved

By FRANK ILLINGWORTH

VERY little had been publicly known about "Bluejay"—the great new air base at Thule, on the N.W. Greenland coast—until Maj. Gen. James W. Spry, commander of the Atlantic Division of the U.S.A.F. Military Transport Division, recently revealed some guarded facts. He said that transport aircraft had made 2,100 trips to fly in men and equipment, their loads aggregating 12,500 tons of cargo and 19,000 passengers. The latter included 3,000 workers flown from the U.S.A. in March, 1950, to begin the project (some of these men, it will be remembered, were rumoured to have earned £240 a week). During the 2,100 flights there were only two accidents, both without casualties. In this article Frank Illingworth throws some new light on the venture.

THE construction of the new United States air base at Thule, in North-West Greenland, 900 miles from the North Pole, represents one of the biggest undertakings of its kind in the history of aviation, and also one of the most dramatic. It involved several major problems, together calculated to test to the full those charged with their solution.

The problem amounted to this: To transport an initial 20,000 tons of heavy engineering equipment and several thousand men across dangerous seas subject to heavy pack-ice; to land them on a distant shore jammed between grinding floes and the 9,000-foot wall of the Greenland ice-cap; and to continue ferrying-in men and materials during the ten months that the Thule coast is totally inaccessible to shipping, which involved the maintenance of a major airlift under the worst of polar conditions.

The project was rendered doubly difficult by cold, paralysing to men and machinery alike; winter-long darkness; constant blizzards; difficulties of navigation born of Thule's proximity to the North Magnetic Pole, and those of radio reception arising from atmospherics; and, lastly, what is known as permafrost.

Permafrost is one of the major problems in airfield construction in the polar regions. The ground can be frozen to a depth of more than 1,000 feet. The surface-soil melts in summer to a depth of six inches or so, transforming thousands of square miles into *muskeg* (bog) which offers the most difficult conditions for airfield construction. In winter, moisture wells up from the permafrost to form masses of ice above ground. Sometimes this can be ten or fifteen feet deep—a veritable glacier. Look at an ice rink after skating and the tracks of the skates will be found to be filmed with moisture. This results from pressure between the skate-blades and the ice. In the same way, on a grand scale, pressure between permafrost and the top few inches of surface that freezes in autumn causes moisture to seep upwards to form these veritable glaciers on the surface.

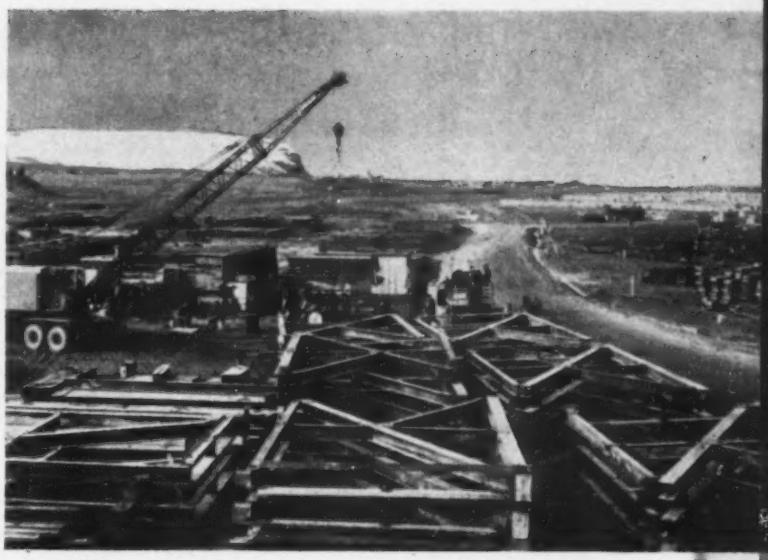
The problem has been the subject of considerable research since the war, the most recent example being the joint Canadian-U.S. Exercise Eager Beaver in Canada's frigid Yukon Territory last winter, when landing-strips were built on muskeg for test purposes. Experiment has proved that permafrost will "buckle" concrete and macadam laid on frozen ground, but that the buckling can be prevented by laying the surfacing-material on a thick insulation of gravel. This is no doubt what the Americans have done at Thule, to judge by the tens of thousands of tons of gravel that are known to have been moved there for the construction of the airfield.

Permafrost is also a serious problem in the construction of airfield buildings. It has been known to "flow" up through the floor of a building and pour out of the windows in the form of a glacier, to shatter foundations and almost to turn a wooden building over. A Canadian engineering firm has developed a building with raft-like foundations, which sits on the ground and can be hauled to a new site when threatened with permafrost upheaval. Another important development, particularly in the construction of large buildings like hangars, is one pioneered by the Russians. Foundations are built on piles driven into the frozen ground, not with hydraulic hammers but by the simple expedient of using steam jets to melt holes wide enough to take the piles. The latter are long enough to reach a depth where there is no possibility of the permafrost melting, so that the ground on which they rest remains for ever almost as hard as concrete.

These two methods of construction are used widely throughout the Polar Regions and no doubt the former has been employed for small airfield buildings at Thule and the latter in the construction of its steel-framed hangars. Six hangars have been built; four more are under construction and, to judge by the drive that the Americans are showing in this bleak corner of the Northlands, the steel skeletons will be completed by the end of this month.

Work first began in March 1950, when the sea-route to Thule was still closed to shipping. In that bleak month the first of 3,000 construction workers were flown to the make-shift airstrip built on the beach during the war. Within three months this strip had grown into a runway capable of handling heavy transports. There were no hangars, and the

Men of the U.S. Army Corps of Engineers unload transport—including, it will be noticed, a number of amphibious vehicles—at Thule. Approach by sea is possible during only two months of the year; for the rest of the time loads must be air-lifted.



Troops handling partly prefabricated structural steelwork for the airfield buildings. As the author of this article explains, the constructors are up against problems unimagined in warmer climates.

aircraft of a growing airlift had to be serviced in the open in temperatures of 50 below zero F. But the work was pressed ahead at a remarkable speed.

The Americans were slow to release information about their new base. Indeed, not until it became a focal point in the rescue of the crew of the R.A.F. Hastings forced down when dropping supplies to the British North Greenland Expedition [*see below*—ED.] did they release a little—just a little—information about Thule, together with some non-committal photographs.

But this we can say. The new base covers an area of at least 85,000 acres. Its runways are sufficient to accommodate the eight-jet B-52s, which, operating from Thule, would be able to reach into the heart of the Soviet's Asian territories—should the cold war grow hot. It is served by harbour facilities capable of handling ships of 10,000 tons, and the prefabricated village flown in during the early stages of construction is now almost a small town.

A tall radio tower has been constructed, and a constant stream of bombers and transports (mainly the latter) plies between the Ultima Thule* of 1952 and bases in Canada and the United States; and jet fighters have been operating for some months.

It might be asked why a location beset with pack-ice and an ice cap, and with many hazards, should be selected as the site for a major airfield. The answer is that sea-ice and ruggedness limit the number of possible Arctic sites to a handful, and that Thule of these was the least unsuitable. And if the base is of utmost strategical importance today, it may well before long prove of great benefit to civil aviation—a staging-post on the scheduled routes between Europe and North America, the Soviet Union and the Far East.

* *Thule was given its name by the Danish-Eskimo explorer Rasmussen who named it after the Greek "back o' beyond"—the edge of the world.*

NINE DAYS on the ICE CAP

ELEVEN of the twelve men who had been stranded on the Greenland ice-cap for nine days, following a forced landing while dropping supplies to the British North Greenland Expedition, arrived back at Topcliffe, Yorkshire, on Thursday of last week. The twelfth man, Capt. Stover of the U.S.A.F., remained at the American polar base at Thule, whence the crew had flown back to Britain.

The exact reason for the accident could not be given, as it is to be the subject of an enquiry, but F/L. Clancy, captain of the Hastings, said: "We were loaded with four and a half tons of supplies, three-quarters of which had to be dropped by parachute. We contacted the expedition and started running-in at 400ft. It takes the full powers of one's concentration to drop a load there. It is just a vast expanse of snow with ripples here and there. After dropping the parachutes we came down to 50ft to free-drop the remainder. It was then that the crash happened."

F/L. Clancy went on to say that the accident happened in a matter of seconds and, after the aircraft had skidded to a standstill, he checked that the occupants were safe and that normal emergency precautions had been carried out. One of the engines, which had petrol fumes coming from it, was banked with snow to prevent fire. Smoking was not allowed for the first two hours.

Instead of acting on arctic survival instructions and digging holes in the snow in which to live, the crew draped the fuselage interior with six layers of parachute silk and covered the floor with sacking. These precautions gave some measure of insulation from the extreme cold. The outside temperature was −17 deg C and there was a wind of 20 kt. A big problem was the condensation

(Left) The ski-fitted Dakota on the Greenland ice cap waiting to take off the final nine members of the Hastings' crew. (Right) The Grumman Albatross amphibian landing alongside the Hastings to take off the three slightly injured men.

NINE DAYS ON THE ICE CAP . . .

resulting from the men's moist breath, which formed icicles in the fuselage.

L/Cpl. Fussey, one of the army loaders, kept a diary and his description of the accident on September 16th reads: "We were loading up the platform for a second run-in. I noticed we were climbing. I estimated we had reached 200ft when things suddenly began to happen. The platform cleared of stuff and I fell across it. It slipped forward and I found myself hanging head-first out of the aircraft, up to my waist in nothing. Suddenly a thousand icy-cold needles hit me in the face. I felt a great wave of joy and relief sweep over me, as I realized it was snow."

The B.N.G. Expedition sent out three dog teams with medical supplies from the camp where the Hastings had been dropping stores. Although only a mile in length, the journey took over 50 minutes to complete, because of the cold and the rarefied atmosphere at 8,000ft.

Despite the hardships of the situation, and the fact that three of the members were to some extent injured, their spirits were very buoyant—so much so that on the fourth night a "party" was held in the fuselage, the expedition members being invited to attend. On the first Sunday Cdr. Simpson conducted a service at which hymns were sung, and the lessons were read by F/L. Clancy.

The Hastings carried arctic survival kit which included sleeping bags, cooking utensils and stoves. Survival suits were tried but it was found that movement was difficult while wearing them.

The Hastings aircrew outside the American hospital at Thule, where they were taken after being rescued from the ice cap.

FROM ALL QUARTERS

Home Even Quicker

RETURNING from Nairobi last week, the English Electric Canberra B.2 which carried Air Chief Marshal Sir Hugh P. Lloyd, A.O.C in C. Bomber Command, to the stand-down ceremony for 82 Squadron's African surveying, returned home last week in even quicker time than it went out. The actual times were: Nairobi to Benson Oxon, *via* Fayid, 10 hr 51 min total elapsed time. The net flying time was 9 hr 46 min, representing an average speed of 456 m.p.h. Not only do these figures reflect upon the extreme efficiency of the Fayid refuelling crews, but they would have constituted a world record if the flight had been officially observed.

R.A.F. Sabres Arrive

A MAJOR addition to the defensive strength of the R.A.F., pending the arrival of Swifts and Hunters, will be made by the delivery of a large number (unofficially reported to be between 300 and 400) of Canadian-built North American F-86E Sabre interceptors. This outstanding type, which is credited with a speed of over 670 m.p.h. and has proved its operational worth over Korea, will thus be the first swept-wing fighter to enter squadron service with the R.A.F. Production of Sabres at the Montreal factory of Canadair Ltd. is now well ahead of schedule; not only have the U.S.A.F., in addition to the R.C.A.F., been absorbing some of the recent output, but deliveries to the R.A.F. have now begun.

Pilots of the Transport Command Overseas Ferry Unit brought the first three R.A.F. Sabres into Prestwick on Friday, October 3rd, continuing to the Canadian Sabre base at North Luffenham the following day. They were enthusiastic about the performance of their aircraft—brand-new F-86Es carrying underwing tanks and bearing R.C.A.F. maple-leaf roundels—and reported a trouble-free journey *via* the northern route. The actual stages were Goose Bay-Bluie West One (780 miles), Bluie-Keflavik (750 miles) and Keflavik-Prestwick (850 miles).

The three pilots, S/L. T. Stevenson, F/L. H. Edwards and F/L. H. Deffee, were greeted at North Luffenham by ten of their colleagues from the Ferry Unit at Abingdon, representing the nucleus of the team to be formed for regular delivery of more Sabres.

Conversion training, involving some ten hours' flying per pilot, will be carried out here with the aid of the R.C.A.F., who are also giving technical instruction to 50 Abingdon ground-crew. By the end of this month a party of twelve R.A.F. pilots should be ready to collect a batch of a dozen Sabres for direct delivery to Abingdon, where the formation of a large F-86 unit will soon be in full swing. Deliveries thereafter will continue at an expanded rate, and the first operational Sabre squadrons should soon be receiving their new aircraft. First reports indicate that these units will form part of A.T.A.F. in Germany.

The R.A.F. Sabres, incidentally, formed an advance guard for a mass transatlantic flight over the same route by sixty Canadian F-86s of No. 2 Fighter Wing, which were due to reach their new base near Metz, France, earlier this week.

S.A.A.B.'s New Fighter

ACCORDING to the East Swedish paper *Bestgoeten*, a new Saab jet night fighter—said to be somewhat larger than the J-29—will be tested before Christmas. A spokesman of the Swedish Air Force would neither confirm nor deny the report.

C. G. W. Ebbutt

THE sudden death occurred on October 1st of Mr. Clement George Wilson Ebbutt, assistant designer of the Heston Aircraft Co., Ltd. He was born in 1902, educated at Whitgift School, and apprenticed with Vickers at Erith. His first position in the aircraft industry was with the de Havilland Aircraft Co., Ltd., which he joined in 1924, and which he subsequently represented in Canada and the U.S.A. After a period with Fairey Aviation he joined the Heston Aircraft Company in 1934, and became chief draughtsman in 1937. He was appointed assistant designer in 1951.

One who was closely associated with Mr. Ebbutt writes of the "sad gap in the ranks and lives of his colleagues at Heston." His charming personality, combined with his experience, knowledge and enthusiasm, made him many appreciative friends throughout the aircraft industry. He leaves a widow and three daughters to whom we extend our sympathy.

RUSSIAN NAVAL HELICOPTER: Seen hovering over Khinski reservoir, Moscow, during recent Navy Day celebrations, is this elementary type of pontoon-equipped helicopter.

NIGHT AND COLD-WEATHER FIGHTERS. To celebrate the formal opening of Avro Canada's new gas turbine factory at Malton, Ontario, on September 29th, six CF-100 fighters put on a flying display. The pilots were (left to right) Jan Zurakowski, F/L. J. Fewell, Peter Cope, F/L. P. Needham, F/L. J. A. Watt, and W/C. E. D. Crew.

LATEST HONOUR for Sir Frank Whittle is the Churchill Medal, seen being handed to him by Mr. R. S. V. Barber, President of the Society of Engineers, on October 6th.

Bristol Missiles and Helicopters

THE activities of the Bristol Aeroplane Co. in the guided weapon field are being extended at the request of the Ministry of Supply. It is also learned that the Ministry has instructed the company to build several Type 173 helicopters, and that an inquiry has been received from abroad for a licence to manufacture this type.

South America Way

LAST week the Air Ministry made the following announcement: "Four Canberra bombers of the Royal Air Force, accompanied by two Hastings transport aircraft, will leave this country about the 20th October to make an extensive tour of Latin America. The tour will be one of goodwill and courtesy, and will be of value to the R.A.F. for training purposes. It is planned that the visit to Santiago should coincide with the inauguration, on the 3rd November, of the new President of Chile."

This announcement immediately recalls the tour made in October/November, 1946, by three Lincolns from R.A.F. Station, Scampton. This was similarly stated to have been a goodwill flight to attend the inauguration of a Chilean President.

Although there has been no official pronouncement regarding the Canberra trip, other than that given above, there has been some conjecture as to possible political, economical, and military motives; for example, many of those most intimately concerned with the operation are wondering whether a South American nation might not be a possible purchaser of Canberras.

On Wednesday, October 15th, a reception has been arranged in London in honour of the R.A.F. Goodwill Mission. The hosts are the president, Viscount Davidson, and members of the executive committee of the Hispanic and Luso-Brazilian Councils.

A Year on the Airlift

SILVER CITY AIRWAYS recently completed their first year on the Berlin "minor airlift," the unscheduled freight service which flies out blockaded exports to the German port of Hamburg. The company began airlift operations in September, 1951, first with one Bristol 170 and then with two. Since that time they have flown approximately 305,000 aircraft miles; 900,000 revenue ton-miles; 1,525,000 capacity stage ton-miles; 5,500 tons of freight; 2,300 aircraft hours; and 1,050 round trips.

The contract calls only for transportation of outward loads from Tempelhof to Hamburg. On nearly all trips over this 160-mile stage length the Freighters are loaded to a maximum capacity of more than 10,000 lb. Frequently, however, a backload is carried: on one occasion this comprised some deer for a West Berlin forest. Normal outward loads are usually made up to generators, switchgear and other electrical equipment as well as diesel lorries, soap and precision machinery.

Air Mail Exhibition

AN important exhibition of air mail stamps and covers is to be presented at the Science Museum, South Kensington, from October 14th until March 8th next. It comprises the collection of Miss Winifred Penn-Gaskell, the eminent philatelist who, prior to her death in 1949, assembled an unparalleled selection of air mail stamps and flown covers, together with a number of prints and books of air mail interest. Exhibits range from messages released from unmanned balloons during the search for Sir John Franklin's arctic expedition in 1850 to covers flown across the Atlantic on all such maior occasions—and a very rare cover from the unsuccessful transatlantic attempt made by a Martynside aircraft in 1919. The exhibition, of undoubted historical value and general aeronautical interest, will be opened by W/C. Robert McIntosh, D.F.C., A.F.C., who was a pilot on the pioneer air mail service between London, Paris and Brussels in 1919.

In Memory of a Great King

ON the death of His late Majesty King George VI the nation gave a moving and spontaneous demonstration of the deep feeling with which it will remember his life and reign.

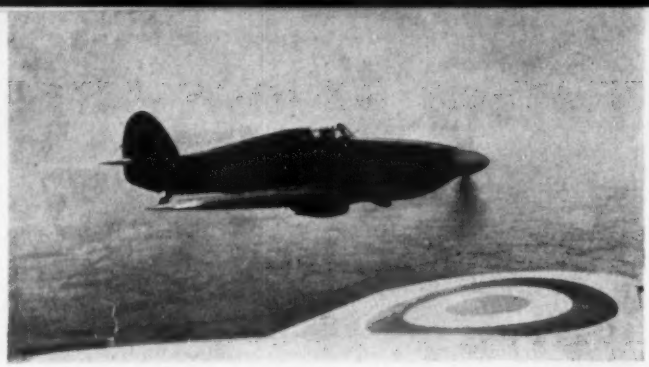
There was a universal wish to perpetuate that memory with some lasting expression of gratitude, so that future generations might know that he was a sovereign who, by his constant devotion to his people's welfare, and by his self-sacrifice and the example of his family life, won not only their loyalty, but their love.

The Lord Mayor of London, Sir Leslie Boyce, K.B.E., was subsequently entrusted with the responsibility of setting up the necessary committees for deciding on the form which the memorial to the King should take. It was agreed that a statue of His late Majesty should be erected and that, also, there should be organized a philanthropic scheme: this, it was decided, should be devoted "to promoting the physical, mental and spiritual needs of young and old people."

To give effect to these aims, the King George VI National Memorial Fund was opened last Saturday, October 4th, and was the subject of a broadcast appeal by the Prime Minister on that day.

Every member of the public is invited to subscribe. Donations may be sent post free if addressed to The Lord Mayor, King George VI National Memorial Fund, London, E.C.4. Cheques should be made payable to the King George VI National Memorial Fund and crossed / and Co. /.

HERE AND THERE



HAWKER'S HURRICANE: When Hawker test pilot Bill Bedford visited Glosters a few days ago in his company's famous blue and gold Hurricane, Russell Adams took the opportunity of securing this air-to-air picture from a Meteor 7 flown by Jim Cooksey. The Hurricane is based at Dunsfold.

Brancker Memorial Lecture

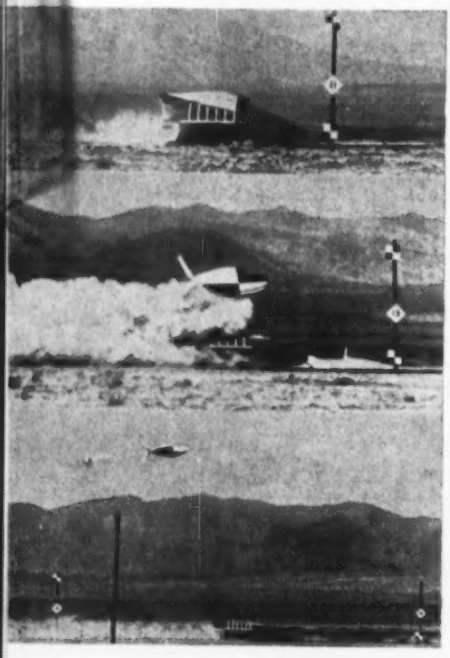
THE Brancker Memorial Lecture of the Institute of Transport is to be given on February 9th, by Sir Frederick Handley Page, whose subject will be *The Influence of Military Aviation on Civil Air Transport.*

Atar-Meteor

TWO SNECMA Atar 101 turbojets, recently delivered to Air Service Training, Ltd., have now been installed in a Meteor. These particular engines are of an early type, less powerful than the Atar 101C (6,190 lb static thrust) and the 101D, of even greater output.

Runways U.S. for the U.S.

DEFECTS in French-built runways at three new NATO airfields in France have postponed their use by American turbojet aircraft. That American Press reports had exaggerated these shortcomings was claimed by a French Defence Ministry spokesman in a recent statement; but he admitted that surface repairs were necessary before two of the airfields could be permanently occupied. He said that surface cracks on runways at Toul and Chaumont (in north-east France), which had been caused by excessive summer heat, would be repaired by the beginning of November. The U.S.A.F. units assigned to these two bases are the 10th Tactical Reconnaissance Wing and the 48th Fighter-Bomber Wing.



PILOT AWAY! Camera impressions during the Douglas cockpit-capsule tests referred to in the paragraph above.

Stopping Short

BAD visibility at Gardermoen airfield (near Oslo) during Exercise Mainbrace obliged an English Electric Canberra to land at Fornebu where the runway is only 1,500 yards long. Only half the distance was, in fact, required.

Vital Minutes

A HELICOPTER-DECK has been fitted to the Danish hospital ship *Jutlandia*, now on her third trip to Korea. It is believed that in some cases it will be possible to fly casualties from the battlefield to the ship in an hour.

Premature News

A RECENT report published in Canada to the effect that R.C.A.F. was likely to order 80 Bristol Britannias has been described as premature by a Service spokesman; he said that, although the R.C.A.F. was looking for aircraft eventually to replace its North Stars and Lancasters, the Britannia was only one of a number of types being considered, and no decision had yet been made.

Gliding Records Confirmed

TWO gliding records have recently been confirmed by the F.A.I.; the British national record for gain of height, and the world record for out-and-return distance, both in the multi-seat category. The former record, of 12,750ft, was achieved on August 16th by R. Austin and A. W. Bedford; and the latter, of 272 miles, by E. Dommisse and S. Barker in South-West Africa on February 9th. Both flights were made in Kranich sailplanes.

Cockpit and All

THE adjacent photographs illustrate some remarkable tests carried out by the Douglas company. From a mocked-up fighter nose (similar to that of the Skyray carrier-borne delta-wing intercepter) a cockpit "capsule," developed for the U.S. Navy, is seen going its way after ejection from a rocket-propelled test rig. In the centre picture the stablizing fins are seen extended, and the third view shows the braking parachute already open. The capsule is buoyant in water. Another type of American-designed capsule is installed beneath a conventional canopy and has a hinged cover which the pilot lowers over his head. He must also retract his feet into the capsule before ejection.

A Record?

AT 21½ years of age, an Indian student of the de Havilland Aeronautical Technical School, K. D. Marwaha, claims to be the youngest engineer in the British Register to have a "D" Licence. This he holds (Class I) for five types of engine—the whole of the D.H. piston-engine range.

R.N. Air Station Closes

THE Royal Naval Air Station at Kintyre, H.M.S. *Landrail*, closed down as an operational station on September 10th, when it was taken over by the Ministry of Civil Aviation on a "care and maintenance" basis. It had been reported earlier that the station was closing down temporarily for runway reconstruction, but it is now thought that there is little prospect of it re-opening for naval flying in the near future. Reasons of economy are believed to be behind the decision.

Concerning the Swift

FROM the *Central Flying School Magazine* we reproduce the following details of the Vickers-Supermarine Swift Avon-powered intercepter fighter. This machine, states the journal, differs from the Type 535 in that the gun installation has been repositioned in the fuselage, a simplified air-brake has been developed, and the fuel system has been redesigned to ensure continuity of supply despite combat damage to individual tanks. Moreover, the internal fuel capacity has been increased and is now "in excess of official requirements"; in addition, an external overload tank may be carried.

East German Production?

IT is learned from Germany that officials of the Junkers factory at Dessau (Eastern Germany) have been searching for former members of the company, especially the technicians who worked under Professor Hertel. As none of these has been located, efforts have been made to obtain people of similar qualifications from Western Germany. Although, according to one report, Junkers were to receive aircraft development orders, and other orders for the design of details, it is now learned that, after a meeting in Karlshorst, all orders for building up an aircraft industry in East Germany were cancelled—apparently because it would be impossible to keep details secret. A correspondent adds that major components of Soviet aircraft are to be sorted at Finow and Grossenhain and assembled there by Russian workers. Germans, apparently, are not considered sufficiently trustworthy for the job.

ACHIEVEMENT

More than

1,000,000 flying hours

have been completed

by Rolls-Royce

gas-turbine

engines

ROLLS-ROYCE

Aero

ENGINES

FOR SPEED AND RELIABILITY

VANDERVELL
Thin Wall Bearings
SERVE ALL BRANCHES OF THE
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THIS MARK
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Smee's V71

HERE AND THERE . . .

R.A.A.F. Strength

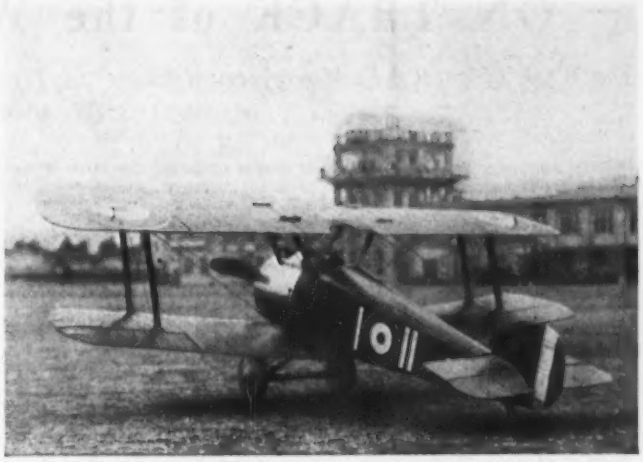
MR. W. McMAHON, the Australian Minister for Air, said in a recent statement that the permanent strength of the R.A.A.F. would soon be about 16,000, of which approximately 3,000 would be trainees. In addition, there would be about 5,000 National Servicemen under training.

For the High Jump

TWO new Soviet aeronautical achievements have been claimed by Moscow Radio: the "world record" and "women's record" parachute jumps. One Pavel Storchenko is said to have made a night jump of 10,000 metres (32,800ft) with a 9,000-metre delay, and Valentina Seliverstova a night jump—from an unstated altitude—with an 8,000-metre (26,000ft) delay. It is worth recalling that, some 18 months ago, jumps of 42,400ft, 42,200ft and 41,600ft were made by officers of the U.S.A.F. as part of an equipment-testing programme in New Mexico.

Italian "Air Scooter"

IN 1927 Count Mario de Bernardi broke the World Speed Record at 318 m.p.h. and in 1941 did most of the flying with the Caproni-Campini jet aircraft. Now he has designed an ultra-light aircraft which he hopes will be mass-produced near Milan. Powered by a 125 c.c. engine, with a fuel consumption of 250 m.p.g., the aircraft will be styled MDB—1951, the year in which "MDB" finished the design. Some curious features are reported to figure in this project, including a helicopter-type rotor "which will permit a landing on a roof-top," and a "bicycle-pedal linkage for use in emergencies."



UNUSUAL VETERAN seen at Croydon Airport recently was a Sopwith Camel 1F1. Though the fact is not immediately apparent from this skilfully planned photograph, it is actually a 40in-span flying scale model; the constructor is Mr. R. Hutchins, who will exhibit it at the forthcoming Model Engineering Exhibition in London (October 20th-29th). Mr. J. G. A. Fletcher posed the picture, on the apron in front of Croydon's control tower.

IN BRIEF

THE directors of Folland Aircraft, Ltd., have recommended a final dividend of 6 per cent, less tax at 9s 6d, for the year ended June 30th, 1952.

* * *

The company and employees of Tecalemit, Ltd., have contributed £150 to the Lynmouth Relief Fund.

* * *

The current issue of *Yachting World*, published on October 3rd, is an enlarged special number containing a full preview of the marine section of the London Motor Show.

* * *

From Mr. D. M. Roberts of Roberts and Wootton, Ltd. (aeronautical, mechanical and consulting engineers, of Cranleigh, Surrey), we learn with regret of the death of his partner, Mr. G. H. Wootton, in an accident at Guildford on September 23rd.

* * *

Recent visitors to the Bristol Aeroplane Company's works have included the Australian Minister of Civil Aviation, Mr. H. L. Anthony, with his wife and departmental officials; Lord Waleran; and Mr. Reginald Bennett, M.P. They enjoyed flights in a Sycamore helicopter.

* * *

From the Trevor-Johnstone Co., Ltd., 14 Berkeley Street, Piccadilly, London, W.1, comes a brochure describing the "Dictorel" magnetic dictating unit for use by business executives when travelling by air, road or train. This company is also responsible for the R.V.A. 492 airport recorder, as installed at Melsbroek, Brussels; it gives 192 hours' continuous recording, with instantaneous play-back.

INDOOR FARNBOROUGH: Another remarkable model-making effort, this time by Mr. W. O. Doyland, of Weymouth, who for many years has specialized in constructing scores of aircraft to a scale of 1in : 6ft. He intends to make his collection available for exhibition in aid of aviation and other charities.

At the recent annual general meeting of the Saunders Valve Co., Ltd., the chairman, Mr. J. C. Billingham, F.C.A., stated that sales of the company's specially developed aircraft cocks had "risen substantially" during the trading year.

* * *

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2, have issued a new leaflet describing the characteristics of their "Glasef" P.T.F.E. aircraft wiring cables.

* * *

The Morganite positive-drive unit seal, primarily for use on low-pressure rotary pumps handling fluids at temperatures up to 100 deg C, is the subject of literature from the Morgan Crucible Co., Ltd., Battersea Church Road, London, S.W.11.

* * *

In 1949, James H. McClean of Belfast, then an apprentice with Short Brothers and Harland, Ltd., was awarded the Hele-Shaw Prize and Medal by the Institute of Mechanical Engineers—the first time that this award had been made in Northern Ireland—for outstanding merit at the Belfast College of Technology. In 1950, the company awarded him a bursary to take the two-year post-graduate course at the College of Aeronautics, Cranfield, where, last July, he obtained the College Diploma (with distinction) in Aircraft Design. Short Brothers' directors recently presented him with a wrist-watch in recognition of his outstanding academic record.

J. H. McClean.

ON TRACK of the WEATHER

The Work of an R.A.F. Meteorological Flight : A Typical Atlantic Sortie Described

By B. J. MITCHELL, R.A.F.V.R. (Met.)

FOR many people the word "Bismuth" merely conjures up the thought of a common aid to minor digestive troubles; but to a small band of R.A.F. aircrew, however, of which I was a member, it is the wartime code-name of one of the Atlantic meteorological reconnaissance flights.

These weather flights originated late in 1940, when meteorological information was scarce and its lack added to the difficulties of forecasting for operations by Bomber Command over enemy-occupied Europe. The first weather flight came into being under Coastal Command and rapidly developed until, at the end of the war, ten such flights were operating over the Atlantic and North Sea, with such fanciful names as "Recipe" and "Nocturnal."

Today, of these only one remains, the "Bismuth," operating over the Atlantic from Aldergrove in Northern Ireland.

The aircraft used are Handley Page Hastings 4. Powered by four Bristol Hercules 106 1,675 h.p. sleeve-valve radial engines, developing nearly 7,000 h.p. on take-off, they cruise at a speed of 250 m.p.h., with a maximum ceiling of 28,500ft, and an all-up weight of 78,000 lb. Their capacious fuselage and reliability make them most suitable for arduous flights and special fittings include a galley for hot meals and seats in the rear fuselage for off-duty crew members.

Preparations for the flight begin the day previously. The aircraft to be used is serviced and fuelled with 2,600 gallons of aviation petrol. Rations and survival equipment are loaded and checked. The navigator reports to the meteorological officer, and works out the take-off time from preliminary forecast winds. The Central Forecasting Office at Dunstable decides whether the usual track is to be flown or a special sortie made.

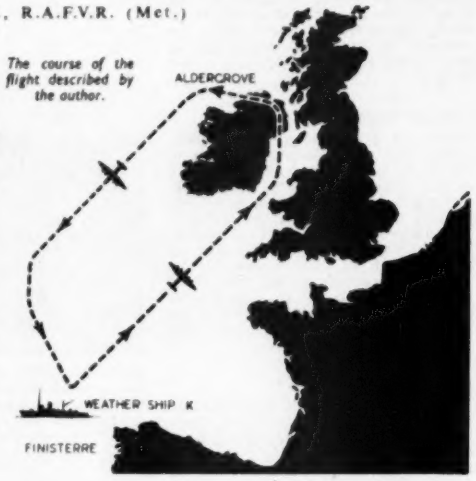
At last the time comes, and at 7.15 the next morning we are awakened by the duty aircrew N.C.O. After a quick wash we climb into the aircrew coach, laden with flying clothing, diversion kit, log-books, thermos flasks, sandwiches and all the paraphernalia needed for a ten-hour flight.

After a "flying meal"—eggs and bacon—we make our way to the control-tower for met. briefing. Today, as often happens, we will fly through a depression which—we are told by the met. officer—is moving N.E. and which we should meet about 400 miles out. The situation can mean ten hours' cloud flying on instruments, or in clear blue skies and sunshine, or in a little of each type of weather; but, unlike civil aircraft, we must maintain our track, no matter how bad the weather may be.

Briefing over, we make our way to the aircraft. Equipment is stowed away; Mae Wests and parachute harness are adjusted, and we settle down for the next few hours. Engines are started and run-up; there are no snags, and we taxi to the duty runway. On receipt of the green light from the caravan the skipper opens up the engines and we thunder down the mile-long strip of concrete, becoming airborne at a speed of 110 kt. A gradual climb to safety height (3,500ft) is made and course set for Donegal Bay. In the distance the Mountains of Mourne stand out, while below the tiny lakes sparkle in the sun, and the wild stretches of peat bog lie as far as the eye can see, broken only by the odd white crofter's cottage.

Soon the coast is reached, our last sight of land for the next nine hours. Apart from an occasional ship we shall be alone, our only link that of radio.

Aircraft used for the work are Hastings—in this illustration a Met. Mk 1. They can be identified by their Coastal Command colour scheme.



The course of the flight described by the author.

The met. flight proper now begins with a descent to reporting height of 1,500ft. The meteorological observer (myself on this occasion) sits next to the pilot on the starboard side. He is the key crew-member, as it depends on him whether the flight is successful or not. Grouped near him is a comprehensive range of instruments: a psychrometer for recording temperature and humidities, a frost-point hygrometer for dew-point at sub-zero temperatures, an aneroid barometer, radio altimeter, ordinary altimeter and a high-level radar altimeter. A special compass, air-speed indicator, drift-sight indicator, and smoke and flame-float tubes also assist him in his weather watching. Mainly, however, he relies on his eyes for reporting cloud types and height, types of weather, visibility, icing and unusual weather phenomena. Behind him sits the navigator, who passes him winds encountered in flight, and times for observations, which are made every 50 nautical miles. Seated with his back to the navigator is the flight engineer, whilst behind the pilot is the radio operator. The other two crew members, the co-pilot and second radio operator, take turns in relieving their opposite numbers.

We are now about 200 miles out and it is time to descend to sea level. With all engines at full power we dive to within 100ft of the surface. Even in the best of weather this is a time for precision flying; the sea seems very close, with the grey Atlantic rollers rushing by the very wing-tips. Today it is really rough with a 40 m.p.h. wind blowing and waves about 30ft high covered in spume. The windscreen is covered with spray; the co-pilot stands behind reading our height off the radio altimeter: "100 feet . . . 80 . . . 70 . . . 90 . . . 100." Then the met. observer finishes his readings, gives "thumbs up" and, with a pull back on the stick, we once more climb to the comparative safety of 1,500ft.

The information gathered is put into an international met. code and sent by W/T to base, where it is then sent by teleprinter to Dunstable and widely relayed by radio and teleprinter networks, for the Atlantic is the breeding-ground for nearly all our weather.

So far we have been flying out on a S.W. track; now we change course to due south, and, after a further 100 miles, we begin the spiral climb to 18,000ft. This is one of the most important parts of the flight. We are now in the middle of the depression; it is dark inside the aircraft and we have the lights on. The rain drums on the Perspex windows and metal fuselage and we are tossed about as though the Hastings were a cork; naturally, we are well strapped in. A complete weather observation is made every 1,500ft as we climb. It soon becomes lighter, and suddenly

ON THE TRACK OF THE WEATHER . .

we burst into blinding sunshine and clear skies at 18,000ft. Below, the white billows of cloud stretch as far as the eye can see. It is difficult to imagine bad weather three-and-a-half miles below.

We are now on oxygen, but that does not prevent us from having hot soup, tea, sandwiches, and chocolate. It is warm, too, and shirt-sleeves are the order of the day.

At 45° N. 15° W. we change track again to NE. on the last leg home. We are only 100 miles from the French weather-ship K. The skipper calls them up on the radio telephone—"Weather-ship King, Weather-ship King, this is Clearcut Charlie, we are due north of you, height 18,000 feet, true air-speed 180 knots. Request radar fix. Over." A clear voice comes back to us: "Clearcut Charlie, your true position is 45° 02' N. 15° 25' W." In the background we can hear the pilot of a westbound Atlantic airliner also requesting his true position. This is the only time we are in contact by R/T; sometimes even the weather-ship is not listening on our frequency. Our nearest land is the NW. tip of Portugal, now only 300 miles away.

Once more we descend through the clouds to sea-level. The depression is now to the NW. of us and the cloud breaks as we near the Pembroke coast. Directly ahead of us is the Smalls Lighthouse; we are dead on track—no mean feat by the navigator in such weather. Shortly before this we had flown over one of the "Queens" inward-bound to Southampton and rolling heavily in the swell.

Another climb to 3,500ft enables us to clear the National Airways "Green One." To the west the Mountains of Mourne appear again, a welcome sight; then we are over Belfast, and a few minutes later rolling down the runway at Aldergrove.

Seven tired men climb out, conscious of a job well done and deriving some satisfaction from the knowledge of having helped in the work of forecasting tomorrow's weather.

MALTON OFFICIALLY OPENED

THE new airframe and gas turbine plant of A. V. Roe (Canada), Ltd., at Malton, near Toronto (described in our May 2nd issue) was officially opened on September 29th by Mr. C. D. Howe, Minister of Defence Production, who said that a recent Government order worth $66 million had been placed for the company's Orenda engines intended for Canadian-built F-86 Sabres. Assembly is one of Malton's more important functions, with about 400 outside firms supplying sub-contracted components.

CANADAIR RECRUITING

SIGNIFICANT, especially in view of the Canadian Defence Minister's recent announcement of Canadian production of F-86E Sabres for Great Britain, is a report from Montreal that Canadair, Ltd., plan to have 16,000 employees turning out jet aircraft for the NATO countries by mid-1953. An official of the company has said that an intensive recruiting campaign in Canada failed to fill the need for skilled workers and that the firm turned to Great Britain for certain specialized workers. Eighty-five have been recruited and each has been loaned passage money for himself and his family and guaranteed 300 dollars (£100 sterling) for his first month in Montreal while he looked for living quarters. At least 40 are already in Canada.

UNIVERSITY RESEARCH

UNDER the title *Scientific Research in British Universities* 1951-52, a new publication by the Department of Scientific and Industrial Research constitutes a guide to recent and current work being undertaken at universities and colleges throughout the United Kingdom. "The list," it is claimed, "is unique and has previously been confidential."

Originally the list (now brought up to date) was prepared for an Empire scientific conference in 1946 and was later taken over by the British Council. It was intended for the Council's use only, but there were so many enquiries and requests for copies that it was obvious there was a greater demand. The D.S.I.R. has arranged to sponsor its publication in future; the British Council will continue to collect the material.

Details of the research work are arranged according to university. They include the names of the staff working on the problem and enough description to show the scope of the research. The names are so indexed that it is possible to find out where a particular person is and what he is doing. It is hoped that the list (which is obtainable at H.M. Stationery Office, price 8s, or 8s 6d by post) will be an annual publication from now on.

HELICOPTERS TIME-TO-HEIGHT RACE

A "VERTICAL RACE" was the outstanding feature of the Coupe Stemm helicopter competition in Paris on Sept. 28th. Four aircraft, taking off from a street crossing near the foot of the Eiffel Tower, were timed by observers on the tower from the moment their rotors drew level with the Foch statue in the Place du Trocadero until they reached the level of the third platform—a climb of 300 metres (975ft).

The winner was M. Jean Moine, in a Bell 47 B-1, whose climb took 59 sec. Later the four aircraft competed in a regularity trial over three 31-mile circuits of the city, during which they had to descend at the turning-points, making spot landings which involved the bursting of ballons pegged to the ground.

M. Moine won the Coupe Stemm and a prize of Fr.120,000; Gerard Henri (Hiller 360) was second and Edouard Lecouer (Bell) was third.

A Bell 47-D in the shadow of the Eiffel Tower during the unconventional competition referred to in the news-item above.

TWO-WAY TRAFFIC

REPRESENTATIVE Francis E. Walter, of Pennsylvania, writing recently in the *Philadelphia Inquirer*, has commented on Anglo-American aeronautical effort. He denounces emphatically the too-often heard opinion that the U.S. is always giving and Britain always taking, and cites examples to prove that, in the case of aviation, Britain's contribution has been at least equal to that of the United States.

The handing-over of information on the development of the gas-turbine aircraft engine to U.S. representatives at the Ministry of Aircraft Production, London, in July, 1941, is quoted by Mr. Walter as the first important knowledge-sharing occasion, which made possible the flight of the Bell P-59A one year later. Other instances of co-operation have been connected with radar, radar navigational aids, the "Block-buster" ten-ton bomb, pressurized flying suits and ejector seats, in the past; and flight refuelling methods and fuel tank safety precautions are being jointly discussed at present. The outstanding British turbojet aircraft of the past few years are described, to emphasize the British industry's capabilities, and it is pointed out that the Rolls-Royce Tay, the Nene and the Armstrong Siddeley Sapphire are all being built in the U.S. and are fitted to many American military aircraft.

SABRE SUPERSONICS

SINCE the sonic demonstrations took place at Farnborough, *Flight's* morning mail has seldom failed to include one or more letters about the bangs. Last week we printed explanations advanced by a lecturer in aerodynamics, while in our correspondence columns appear some other thoughts and theories. Below is a rather different communication—but one still concerned with sonic bangs—which has been received from F/L. S. A. Marshall, P.R.O. to the R.C.A.F. in this country:

"The F-86 Sabre can exceed the speed of sound by diving vertically. The dive is usually begun at 40,000ft and the pull-out comes around 25,000ft. The aircraft, by going through the sonic barrier, can create an explosion on the ground directly below its line of flight. The aircraft sets up a Mach cone which is really a huge shock- or pressure-wave ahead of the aircraft. There is also a smaller wave from the tailplane. The two waves have a difference of static pressure and when the aircraft is pulled from the line of flight the observer on the ground can distinguish a small puff of condensation. The waves carry on to the ground, with a resultant explosion. Two distinct booms can be heard.

"The booms can be aimed with the gun-sight, although this is extremely difficult due to the great height at which the pilot starts his dive. The usual manner is to roll over on your back and pull the aircraft through. By 35,000ft the aircraft is usually through the barrier. A slight dropping of the left wing is the only reaction felt. The Mach indicator registers the correct speed. The speed of sound varies between about 762 m.p.h. at sea level and 664 m.p.h. at about 35,000ft."

THE YOUNG TECHNICIAN

—and his Training : A Notable Lecture by the Chairman of Rolls-Royce

LORD HIVES, C.H., M.B.E., B.Sc., F.R.Ae.S., chairman and managing director of Rolls-Royce, Ltd., is a very busy man, and it is perhaps for this reason that he is rarely heard in the lecture hall and seldom expresses his opinions for publication in writing. So far as the aviation world is concerned, little is heard beyond the name of the latest products of his factories, for these are the subject of a stringent security policy stemming both from the Government and from Lord Hives himself. In common with other manufacturers in the aircraft industry, Rolls-Royce feel the need not only for more skilled men but for a steady inflow of young technicians selected from among the best brains and to be found in British Universities and technical colleges.

Long personal experience of dealing with staff of all grades from senior technicians to the humblest labourer has made Lord Hives an exceptional judge of men, and his experience is forcefully reflected in the talk he gave during a conference on "Industry and the Universities" held at Nottingham University recently. His lecture was entitled *What Industry Requires from the Universities*, and he referred particularly to the needs of his own companies. Such a subject might have been dealt with in an abstract and academic manner—but not by Lord Hives. We feel that the advice he gave (some abstracts of which are printed below) provides sound practical guidance from which many young men in their teens and seeking a career would profit. Much of the information is intended primarily for those in Universities and schools who are responsible for teaching, for the planning of industrial courses, and for the guidance of young men in the selection of a profession.

Lord Hives said that at present Rolls-Royce employed about 350 people with degrees; 75 per cent of these were recruited from the universities and technical colleges, and the remaining 25 per cent were "home-grown," having during their course of apprenticeship obtained London external degrees by evening and part-time day attendance at the local technical college. This 350 represented about 6 per cent of the total personnel employed on the research, design, manufacture and development of experimental work.

Farther down the academic scale there were about 400 men who held the Higher National Certificate. These figures were on the low side and were much smaller than he had heard quoted for the U.S.A. Lord Hives did not think it necessary to aim as high as the Americans numerically, but we had to maintain, and if possible improve, the quality of our graduates. It would be a very retrograde step to increase the numbers of our university output at the expense of quality. There were indications that there might be a danger of this happening.

The annual Rolls-Royce intake of graduates from the universities was about 30—mainly engineers, with a few metallurgists, chemists, mathematicians and physicists. Selected applicants appeared before a small selection-board, the constitution of which varied to suit the class of work which the graduates might eventually do. The recruitment campaign this year had resulted in 34 men being selected. Of these, eight obtained first-class honours, 17 second-class honours, and six pass-degrees or diplomas; three results were awaited. Bearing in mind that selection and acceptance was completed before the final examination, the results indicated that the selection methods were on the right lines.

After engagement, said Lord Hives, graduates were given a two-year course of practical training, the syllabus of which was very flexible. The training for acquiring the basic craft-skills had been compressed into six months by a process of intensive tuition in a school set aside for the purpose. The next six months were spent in the production shops learning the application of skills, processes and techniques to modern manufacturing requirements. The remaining 15 months' training was more specialized, and the graduates worked side by side with more mature technical staff on the current problems.

A good salary was paid during training, and there was no obligation to accept a position afterwards. Similarly, the management did not undertake to offer positions to all the trainees, but few of the trainees were likely to fall short of the requirements.

"We do not expect the universities to turn out ready-made technicians, designers, metallurgists or chemists. They cannot do so" said Lord Hives. What Rolls-Royce did expect was men who were capable of thinking, who had received basic training in the fundamental sciences, and whose brains had been trained to tackle problems. They wanted men who of their own initiative could follow a problem through step by step, logically, taking advantage of previous experience on allied work. Furthermore, the company liked good citizens who could express themselves well and hold their own in the conference room and report clearly and concisely on their work.

Lord Hives—a new portrait.

It was felt that a man from a resident university had a start on one who obtained his degree the hard way by part-time attendance at a technical college while serving an apprenticeship. But the part-time graduate deserved very considerable credit, for the obtaining of a degree by this means was extremely arduous and exhausting. This year Rolls-Royce apprentices taking London external degrees recorded one with first-class honours, five with second-class honours and three pass-degrees.

In selecting graduate trainees, the confidential reports requested from professors, tutors and appointment boards were considered very carefully. The ability to cram in sufficient knowledge to pass an examination was not the main factor in the selection of a graduate, but other things being equal, a good honours degree was preferred.

If an examination was made of the cases of applicants who had failed to come up to the required standards, they were generally found to lack completely a knowledge of what happened in industry, to have very little idea of what they wanted to do, and in some cases to have a belief that because they had graduated their training was finished and the engineering world was at their feet. The real position was very different. The graduate would leave the sheltered academic atmosphere of the university and find himself in a competitive field where hard work, frustrations and many disappointments confronted him. He had to build up a hard core of experience before he could make a real contribution. There was no magic in it, but the work was interesting and rewarding.

Lord Hives went on to talk about specialized technological education, saying that he did not believe the universities could deal with this satisfactorily because they were too far removed from the very quickly changing requirements of industry and could not afford the extensive, complicated and massive equipment used in present-day engineering. He was doubtful whether the proposal to establish an institute of technology would provide the solution. Rolls-Royce knew something of the men turned out by the Massachusetts Institute of Technology and of some of the Continental institutes. "They are not outstanding as the supporters of mass technological education would have us believe," he said. This was a problem for the industry to tackle.

The rapid evolution of the jet engine over the last six or seven years was largely the result of research and development carried out in the industry. No university or institute of technology could possibly have kept pace with such rapid advances. "We have proved," said Lord Hives, "that Rolls-Royce can do better than any institute of technology in the matter of training in the fields of engineering which we cover. We are conscious that we not only have to turn out the finest products, but part of our obligation is to turn out high-class engineers, designers and technicians."

He went on to say that graduates who came to the firm after three years at a university were preferred. Further residence to proceed to a higher degree was of very doubtful value to the men who intended to enter industry. The result of sending people to certain specialized courses with the object of advancing technological education had so far shown that the courses had very limited value.

Speaking generally, Lord Hives said: "We in the engineering industry are disturbed at the inadequate numbers of men being

THE YOUNG TECHNICIAN . . .

turned out from the universities. We are told during our recruitment campaign that the demand for engineers, chemists, physicists and metallurgists far exceed the supply. On the other hand, the appointments boards are having great difficulty in finding sufficient jobs for arts graduates. We also hear from various sources that the best potential men are either being directed into, or choose to go for, the arts rather than engineering. Surely something is wrong here?

Graduates applying for work were invariably asked why they chose to take their particular subjects, and the replies indicated in the great majority of cases that there had been no thought as to what was going to happen after graduation. The universities did not carry the responsibility for this, but they did spend the money and they must therefore accept a moral responsibility. It was not sufficient just to deplore the fact that many people taking arts could do as well or better in engineering. Industry was not by any means blameless. It could do more than it was doing to publicize what it had to offer in careers. It could and did offer positions equally interesting and rewarding as the professions. If the country's potential brainpower was to be distributed to the best effect, there must be co-operation between the educationalist and the customer. It was too late to deal with this at university level; it should be tackled at the schools.

Lord Hives said that this year a number of leading Rolls-Royce technicians were sent to visit universities, to talk with the professors about problems and to invite them to visit the works, bringing their lecturers along. Assistance was offered in the supplying of industrial data and equipment which might keep them up-to-date with modern trends. Lord Hives added: "In general, I am sorry to say that there did not appear to be much evidence of a keen desire to leave the peace of the cloistered atmosphere of the university for a short while to sample the noisy environment of a virile industrial organization."

As employers of mechanical engineering graduates, Rolls-Royce were able to form an opinion of the relative abilities of the various universities and colleges. Lord Hives said: "Whilst I am not an advocate of nationalizing our universities, I cannot help feeling that it might be better for some universities where the mechanical engineering faculty is very small and relatively ill-equipped, or where mechanical engineering is dealt with in conjunction with civil and electrical engineering, to leave the job alone and release staff and equipment to other universities more capable of dealing with the subject."

Finally, on the subject of management, Lord Hives said: "My firm has always been controlled by engineers. The accountant naturally occupies a very important place in the organization, but primarily we are engineers. The art of administration has been acquired by experience; problems of industrial relations have been dealt with humanly and logically. Amongst our engineers we invariably find men of the qualities necessary for management work, and they come up to administrative positions in the natural course of events by virtue of our system which rewards merit, both financially and by status, irrespective of age or years of service.

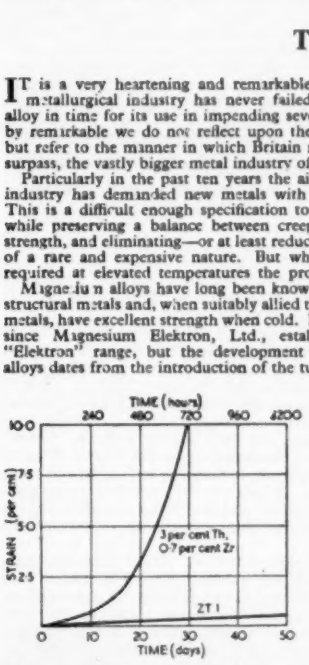
"The message I would like to give to the universities is very simple," said Lord Hives. "We need more first-class graduates. If we have a first-class man we always have at least six jobs we can give him to do. Our anxiety is the average man. It is here we should see an improvement in quality. It is for the engineering universities to demand that they get the best material to work on. They must make their influence felt in the schools."

TOUGHER LIGHTNESS

IT is a very heartening and remarkable fact that the British metallurgical industry has never failed to provide the right alloy in time for its use in impending severe applications. (And by remarkable we do not reflect upon the metallurgist's ability, but refer to the manner in which Britain manages to parallel, or surpass, the vastly bigger metal industry of the United States.)

Particularly in the past ten years the aircraft and aero engine industry has demanded new metals with high creep-resistance. This is a difficult enough specification to be met in any event, while preserving a balance between creep-resistance and static strength, and eliminating—or at least reducing—alloying elements of a rare and expensive nature. But when creep resistance is required at elevated temperatures the problem becomes severe.

Magnesium alloys have long been known as the lightest of all structural metals and, when suitably allied to aluminium and other metals, have excellent strength when cold. It is now some 25 years since Magnesium Elektron, Ltd., established the standard "Elektron" range, but the development of hot-creep-resistant alloys dates from the introduction of the turbojet. The first such



Creep curves for ZT1 and a magnesium alloy containing 3 per cent thorium and 0.7 per cent zirconium. They refer to a stress of 1.5 tons/sq in at a temperature of 315 deg C.

alloy put to use was ZRE1, which contained about 3 per cent cerium mischmetal and could be used up to about 250 deg C.

High-compression turbojets and turboprops are now producing compression temperatures greater than this and a new Magnesium Elektron alloy, ZT1, has now been developed for such powerplants. Its percentage composition is: Magnesium, 93.8; Thorium, 3.0; Zinc, 2.5; and Zirconium, 0.7. The addition of zinc—to a specified zinc/thorium ratio—is a comparatively new, and very beneficial procedure, which permits the acceptance of considerably higher stresses than the Mg/Th alloys not so alloyed; it further prohibits development of tertiary creep within periods of 1,000 hours at temperatures exceeding 300 deg C. An idea of the superiority of ZT1 over an earlier, but related, alloy is afforded by the accompanying time/strain curves.

Only a limited amount of actual application of ZT1 has so far been possible, but it is now well beyond the experimental stage and will permit mass-production of the largest turbojets without the need for any semi-unknown or very expensive materials. ZT1 has excellent casting properties and needs no high-temperature solution heat-treatment; all that is required is a simple anneal at the maximum service temperature to stabilize the structure.

PROTECTING MOLYBDENUM

ALTHOUGH it has been used as a steel-alloying element for many years, the excellent heat-resistant properties of molybdenum are beginning to warrant its use as a metal in its own right. This is particularly true in the United States, where molybdenum components are already found in certain aircraft production applications, notably for turbojets.

The melting point is high at 4,750 deg F, but molybdenum suffers from a proneness to oxydation at elevated temperatures and, to permit the use of components at ambient temperatures of 2,000 deg F, or more, the U.S. National Bureau of Standards has recently conducted research into various protective coatings for the metal.

Specimens were first coated with a powdered, chromium-bearing base which in some cases contained frit (unvitrified glass). After firing in an inert atmosphere this layer was covered by a ceramic sealing coat containing no chromium; this in turn was topped by a lower-melting-point glass coat. Tests showed that it was preferable to have no glass whatever in the base coat. Another feature was that the chromium in the base coat became somewhat porous, owing to the diffusion-welding of the chromium particles to each other and to the molybdenum; these spaces were then filled by the plastic flow of the glass during the firing of the sealing coat.

In service, although thermal strain and rapid creep have tended to cause cracking of the coatings, the fissures so caused have been filled by the external glassy layer. At from 1,500 to 1,800 deg F coated specimens have lasted for between 1,000 and 3,000 hours; while the established duration of about 7 hours at 2,800 deg F is sufficient for a number of special applications.

"FLEXIBLES" CENTRE

SAMPLES and installation photographs of numerous different types of flexible hose—rubber, plastic, composite and metallic—are permanently on view at the new London showrooms of the Compoflex Co., Ltd., at 26, Grosvenor Gardens, S.W.1. A complete advisory service is also available. Although small-diameter hose for aircraft use is not included in the display, Compoflex do manufacture—under licence from Bell's Asbestos and Engineering, Ltd.—a range of asbestos hoses for air-conditioning systems installed in aircraft.

TROOPING BY AIR

How the Independent Operators are Performing a Valuable National Service

SOON after the close of the last war, shipowners were very quick to realize the many advantages held by the aeroplane in the economical transportation of ships' crews between the ports of the world. It gradually became appreciated that if it were cheaper for one user of valuable manpower to employ the aeroplane as a definite saver of time *and* money, it would be equally beneficial for other large employers—such as the War Office—to adopt the same methods. Airwork, Ltd., were among the first to advocate—in 1949—the carrying of troops by air and, in 1950, they became the first of many British independent air transport operators to supplement the work of the troopship. Since that time the several companies concerned have greatly expanded their trooping business while, for some, it has become their bread-and-butter activity. The purpose of this review is to examine briefly the parts played by individual operators participating in this highly organized and very successful new branch of commercial aviation, which is at present responsible for troop transportation at the rate of more than 120,000 a year.

Partly due to their taking over many of Airwork's flights because of the temporary withdrawal of this company's three Hermes for engine modifications, Skyways of London are currently handling almost half the trooping business, flying Servicemen and their families at the rate of over 50,000 a year. In their own words, Skyways have established a "moving air belt" between the U.K. and the Middle East. They first started trooping in September 1951 with one York—the first civil "trooplane," incidentally, to have backward-facing seats. Now Skyways have six to eight 43-seat Yorks continuously in service on trooping flights and completing more than 50 round trips each month to the Middle East alone.

Since Skyways started these flights only twelve months ago they have carried 30,000 Servicemen and their dependents and continue to do so at the rate of 4,500 a month. On July 2nd, 1952, 36-seat Skyways Yorks began to fly troops to and from Jamaica. Flying from Stansted (the company recently moved to this new base from Bovingdon), *via* Keflavik, Gander and Bermuda, the Yorks take 27 hours flying time and make three or four trips each month. It is expected in charter circles that Skyways will be the successful tenderer for a new trooping service across the North Atlantic to Dorval.

Modern troopship: this attractively marked Viking 1A of Crewsair Ltd., is one of the several types of aircraft used by British independent companies on trooping flights; others include the Hermes (Airwork), York (Skyways and Eagle), and Solent (Aquila). Vikings are also used by Airwork and Hunting.

Another very big share of the trooping business goes to Airwork, who normally fly to the Middle East and to Singapore with Hermes. While these aircraft are out of service, however, the work is being undertaken by other independent companies. Airwork's other big job is performed by Vikings based at Malta and Fayid; carrying 20,000 military personnel each year, these aircraft have largely replaced those of Transport Command and the corvettes of the Royal Navy in Mediterranean and Middle East communications work. To replace the Vikings, Airwork are currently giving serious consideration to the Vickers Viscount 700. For other possible work they are taking a good look at the projected civil Valiant, the Britannia (in particular), and both the Comet Series II and III; naturally, however, they are thinking in terms of 1956 and after.

Not necessarily in Airwork's case, but among the independents in general, finance is the greatest barrier facing the purchase of replacement aircraft. Whereas, for example, two new troopships are now being constructed for owners who receive a ten-year operating contract almost automatically, airlines are only able to seek finance for new trooping aircraft on the basis of a two-year contract and, in some cases, no contract at all; naturally, potential backers want more guarantee than this.

Hunting Air Travel fly about 30,000 troops and dependents each year between the U.K. and Gibraltar and Malta. Vickers Vikings are used exclusively.

Eagle Aviation arrived on the scene in the summer of 1951, making four trips a month to Singapore with 45-seat Yorks. These flights continued for six months and then, early in 1952, the company began to fly to Livingstone at a frequency of six trips a month. In August of this year they tendered successfully for three flights a month to Singapore; now, with five Yorks in service, they are flying troops and their families at the rate of 10,000 a year.

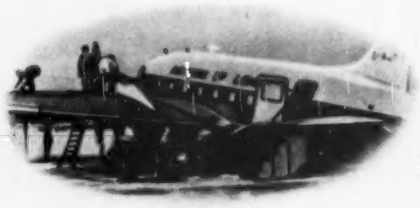
Newcomers to the trooping business, Aquila Airways began to operate a single 53-seat Short Solent flying-boat from Southampton to Singapore at the end of August, travelling *via* Malta, Beirut, Bahrein and Ceylon. They hold but a short-term initial contract but already it is being realized that the spacious Solent has more to offer the family, and especially the children, on such a long journey. Consequently, the present arrangement is for the troops to travel by Yorks and for their dependents to recline in the extra luxury of the Solent. Aquila say they are looking forward to the day of the Princess and that from operating figures available the giant flying-boat appears very attractive for trooping.

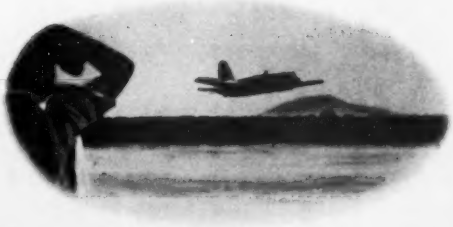
From the operational point of view, Crewsair, who operate the West African trooping service to Accra (and sometimes on to Freetown), have probably the most difficult route of all. They started their present contract in April 1952 and with their four 27-seat Vikings have completed 35 round trips to date. Flying *via* Bordeaux, Gibraltar (night-stop), Gao, Kano (night-stop) and Lagos, Crewsair complete each 7,000-mile round-trip in four to seven days, depending on the maintenance requirement. The present frequency of this West African service is about seven trips a month, corresponding to 4,500 passengers a year. A recent V.I.P. passenger coming home on leave was the G.O.C. West African Command, Lt. Gen. Whistler.

It is generally believed in air-trooping circles that the business has only just begun and that there will be substantial increases in the number of troops carried in the relatively near future. These opinions, which are based on fact, are heavily underlined by the quite rapid build-up of business during the last three months.

J. S. W.

Leaders in private enterprise air transport since 1929, Airwork Ltd. continues to develop along the most modern lines. Airwork's claim to be the largest organisation of its kind in the world is further substantiated by recent forward steps. With the purchase in 1947 of a fleet of Vickers Vikings, Airwork became the first independent operator to fly post-war aircraft. On many Trooping, Army and Sudan Government Leave Services, on the transport of oil company personnel and equipment, these and other Airwork aircraft have been busily engaged for some years past. Now Airwork, in conjunction with Hunting Air Transport, has established the first post-war private enterprise airline — the Safari Service to East Africa. Airwork "looks forward" to further developments, of course.





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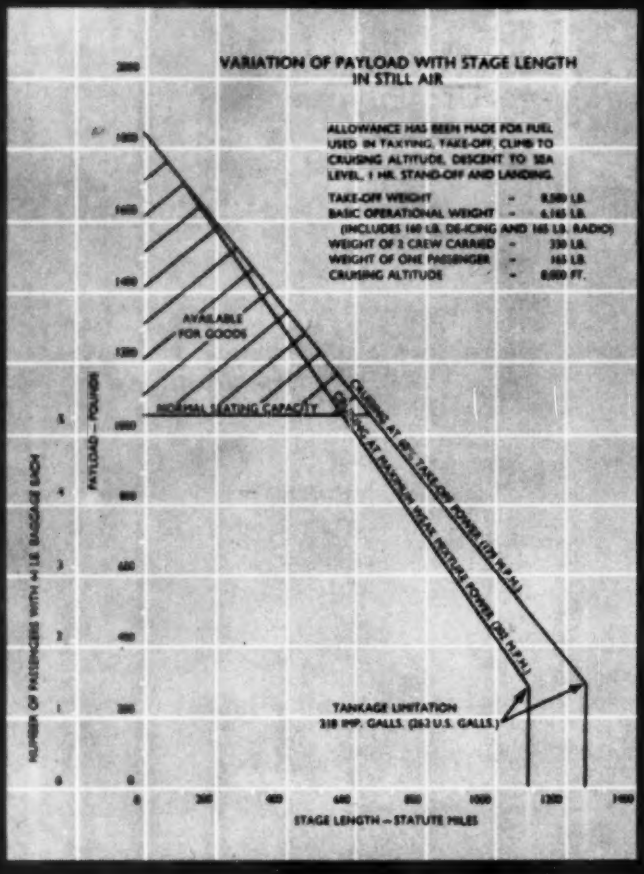
VARIATION OF PAYLOAD WITH STAGE LENGTH
IN STILL AIR
ALLOWANCE HAS BEEN MADE FOR FUEL USED IN TAXYING, TAKE-OFF, CLIMB TO CRUISING ALTITUDE, DESCENT TO SEA LEVEL, 1 HR. STAND-OFF AND LANDING.
TAKE-OFF WEIGHT - 8,500 LB.
BASIC OPERATIONAL WEIGHT - 6,165 LB.
(INCLUDES 160 LB. DE-ICING AND 165 LB. RADIO)
WEIGHT OF 2 CREW CARRIED - 330 LB.
WEIGHT OF ONE PASSENGER - 165 LB.
CRUISING ALTITUDE - 8,000 FT.
AVAILABLE FOR GOODS
NORMAL SEATING CAPACITY
CRUISING AT 80% TAKE-OFF POWER (170 M.P.H.)
CRUISING AT MAXIMUM SPEAK MEDIUM POWER (205 M.P.H.)
TANKAGE LIMITATION
318 IMP. GALLS. (382 U.S. GALLS.)
PAYLOAD — POUNDS
NUMBER OF PASSENGERS WITH 44 LB. BAGGAGE EACH
STAGE LENGTH — STATUTE MILES

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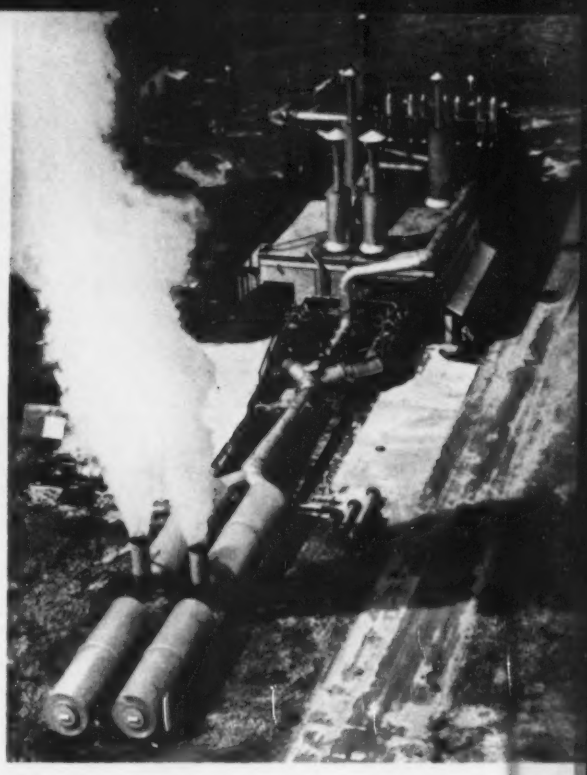
DH AIRCRAFT DH ENGINES DH PROPELLERS

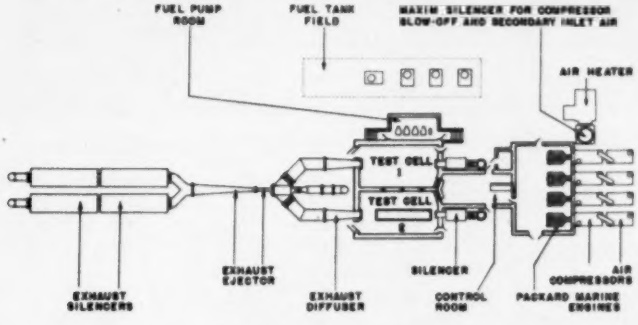
STOVEPIPE LABORATORY

THE vast background of piston-engine development amassed by the Pratt and Whitney aircraft division of the United Aircraft Corporation has, perhaps, proved to be a disadvantage in this era of fundamentally new power plants. For five years this great company has developed and mass-produced turbojets of Rolls-Royce design and only now is the first P and W turbojet—the impressive J-57—about to go into production. But Pratt and Whitney have other irons in the fire; their T-34 turboprop has been under development for several years; and is now about to fly as the standard powerplant of the Douglas YC-124B Globemaster and the Lockheed R7V-2 Super Constellation. And it has now been announced that the company is to produce ramjets for various types of missiles.

The United Aircraft Corporation has been promoting basic ramjet research, under the auspices of the U.S. Navy, since 1946. This will aid Pratt and Whitney in their task of perfecting the most advanced type of air-burning aero engine. The photograph and diagram on this page show a ramjet-burner test house, which is located on the east side of Rentschler airport, adjoining the home of Pratt and Whitney at East Hartford, Connecticut. Jointly supervised by United Aircraft and the Navy's Bureau of Aeronautics, the establishment has been in use since April 1950.

We in Great Britain are by no means behind other nations in the development of ramjets. It may be recalled that at the recent S.B.A.C. Show the Bristol engine division were permitted to exhibit a ramjet test-vehicle which represented the state of their knowledge some three or four years ago.





The dense whiteness of the efflux from the silencers (above) is probably due to steam from cooling water injected into the exhaust ducts. The building is used for study of combustion problems only, and it may have been found possible to economize by testing individual burners.

Several novel features are apparent in the layout of the test-bed (left); in particular, the adoption of a high-speed ejector to assist in extracting air from the test cells is unusual. It appears unlikely that the installation is capable of handling really powerful ramjets.

IMPROVING ACRYLIC PLASTICS

TRANSPARENT acrylic resins have for long been used as aircraft glazing materials; the family includes Perspex (I.C.I., Great Britain), Lucite (Dupont, U.S.A.), and Plexiglas (Rohm and Haas, U.S.A. and formerly Germany). These materials are good optically, and weather well; further, they are comparatively inexpensive and can easily be worked into compound-curvature shapes.

Sponsored by the N.A.C.A., the U.S. National Bureau of Standards has undertaken a programme of pre-stretching such materials in order to examine the improvement in mechanical properties so conferred. The specimens were first heated to about 130 deg C until "rubbery" and were then clamped to the opening at the end of a cylindrical vacuum chamber of about 2ft diameter. A vacuum was quickly produced and the sheet permitted to stretch into the chamber in a hemispherical form. A cylindrical die was then pressed against the concave side of the stretched sheet and air allowed to fill the vacuum.

This method produced a "top-hat," the flat crown of which was uniformly stretched bi-axially about 50 per cent (linear measurement). Test pieces were then cut from the crown, and they provided encouraging results. The tensile strength and secant modulus of elasticity were not greatly affected by the stretching, but the elongation at failure was greatly increased—from about 10 to 60 per cent. The fracture of the formed pieces exhibited a laminar character quite unlike the "straight across" breaks of the unformed specimens; and the fracture surface of the formed pieces showed, in every case, a small mirror-like area perpendicular to the applied load. It was concluded that fracture began in this area as an extension of a crazing crack.

Very significant gains in long-time tensile properties and in resistance to crazing, particularly in the presence of benzine, were obtained and resistance to impact is also reported to have improved. As an alternative to pre-forming the sheet it has been suggested that canopies, radomes, and similar acrylic-resin applications might profitably be formed from extra-deep-drawn sheet, the central portion only being used for the final product. This would have the effect of preparing a more highly stretched enclosure directly, and would be particularly beneficial at the rim, where conditions are most severe in service; not only is the mechanical stress on a canopy highest at the edge, but it is along the rim that contact with active solvents of sealing adhesives is likely. Further, the laminar structure of the formed material also offers the possibility of obtaining resistance to shattering—on a highly-stressed pressurised canopy on a fighter, for example—without employing heavier acrylic laminates with a safety-glass-type vinyl interlayer.

WORLD AIR GATEWAY

Recent Progress at London Airport: Plans for Future Development

"Flight" photograph

Air Marshal Sir John D'Albiac, Commandant of London Airport.

LONDON AIRPORT was planned towards the end of the war as a base for R.A.F. transport aircraft flying to the Far East. The sudden end of the Japanese war enabled the Ministry of Civil Aviation to take over the site (which overlapped that of Fairey's Great West Aerodrome at Heathrow, between the Bath Road and the Great South West Road 14 miles from Charing Cross), and to develop it as the main civil airport for London. This possibility had been envisaged in the original R.A.F. plan, the site having been selected by the Civil Aviation Department of the Air Ministry.

Regular commercial services from London Airport were opened by British South American Airways on January 1st, 1946, and the marquees originally used by passengers were replaced by prefabricated terminal buildings in September of that year. The subsequent progress of the airport has kept pace with the rapid growth of international air transport, and it is now well established as a major air terminal of Europe. Some idea of the expansion of traffic at L.A.P., as the airport is styled by most of its inhabitants, is given by the following figures:

	1946 (June-Dec.)	1947	1951	1952 (Jan.-June)
Movements*	3,783	17,962	34,921	16,092
Passengers	57,109	281,638	796,092	362,352
Freight (short tons) ...	1,083	2,912	14,457	7,476

* Movements for 1946 and 1947 relate to scheduled services only; those for 1951 and 1952 include all air transport.

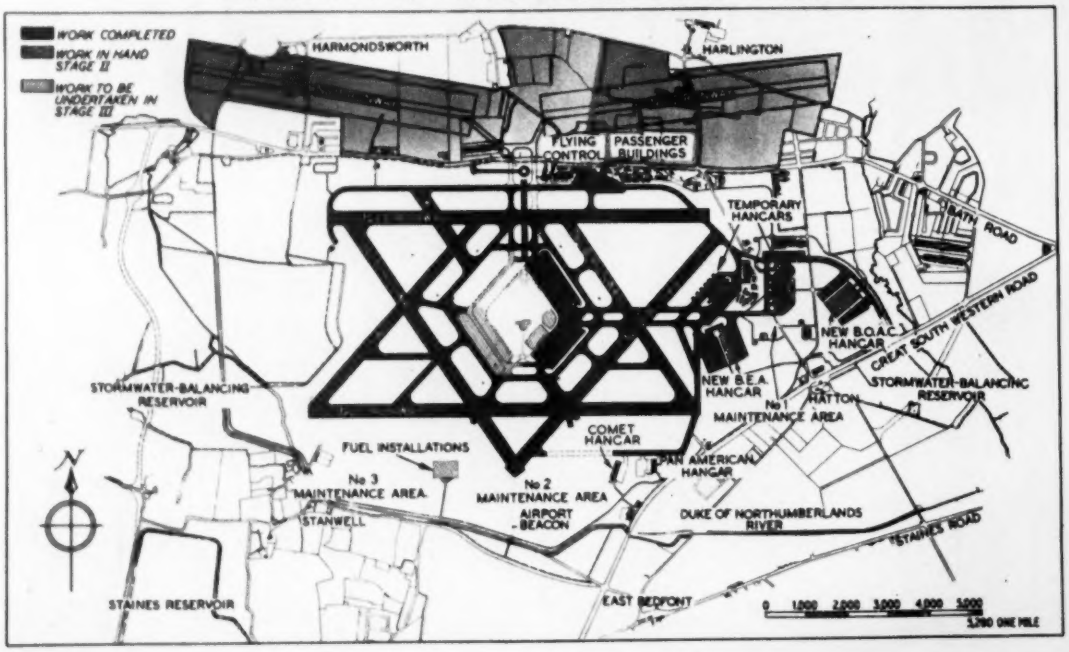
The latest figures to be issued by the Ministry of Civil Aviation, those for August, 1952, show a slightly decreased number (4,113) of take-offs and landings by transport aircraft, by comparison with the figures for the corresponding month last year. The greater capacity of modern long-range airliners (partly as a result of "tourist" seating layouts) is indicated by an 11 per cent increase in the number of passengers who passed through the airport—no fewer than 111,121.

It may seem that the traffic figures for the first half of this year do not show any impressive increase over those for 1951; the main reason was the restriction of services caused by the fuel strike, coupled with the fact that the peak traffic period lies mainly in the second half of the year. Northolt, incidentally, often handles slightly more aircraft and freight than L.A.P.—as it did, for example, in August. Most of the aircraft using Northolt, however, are on domestic or Continental services, whereas London is a focal point for international routes to practically every part of the world.

The steady growth of London Airport's traffic, estimated at 30 per cent annually, creates passenger-handling problems which grow daily more acute. Although the hutted terminal area south of the Bath Road is becoming inadequate, the M.C.A. are reluctant to initiate construction of further buildings on this site, as it is planned to move all the traffic-control and passenger facilities to the 54-acre central terminal area. At the south corner of this pear-shaped site, which is surrounded by all six runways, will be a new control tower, foundations for which are now being laid. Customs and company offices will be placed at the apex of the central area and there will be two main passenger buildings—in the south east for short-haul operations, and the north east for long-haul services. The new public enclosures will be situated on top of these passenger buildings and should give a commanding view of the entire airport (two million people, incidentally, have visited the existing enclosure in the past five years).

Two lines of hardstanding separated by taxi-ways will surround the entire central area, which has already been linked to the Bath Road by a 2,400ft tunnel passing beneath Number 1 runway.

London Airport as it stands at present. Runways No. 11 and 12 (shaded area) will not be constructed before 1955. Lengths of existing runways are: No. 1, 9,280ft; No. 2, 7,735ft; No. 4, 5,798ft; No. 5, 9,504ft; No. 6, 7,570ft; No. 7, 6,260ft.



Work in progress on B.E.A.'s giant new maintenance base. A recent photograph of the block of five hangars under construction.

Built by the "cut-and-cover" method, the tunnel is divided into two 20ft wide carriageways and two cycle and pedestrian paths, each with fluorescent lighting; additional subways will connect the aircraft parking areas to the main carriageways, which have a capacity of 2,000 vehicles hourly in each direction.

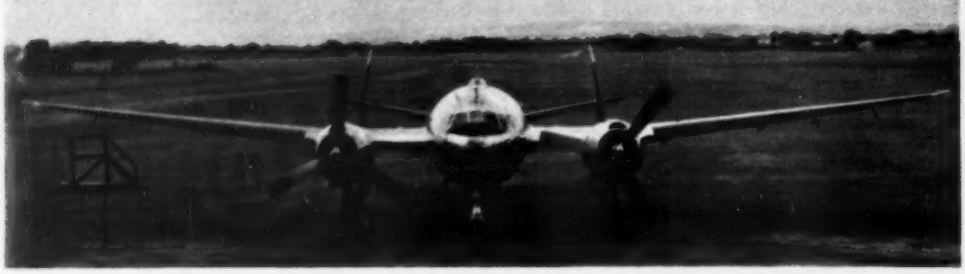
As shown in the map, the airport has three separate maintenance areas. No. 1, of 240 acres, is completely devoted to the engineering needs of the two Corporations, whose new maintenance bases are well under way. The B.E.A. base is, in fact, partially completed and five of its ten hangar pens are being used for maintenance of Elizabethans. The other block of five pens, each 180ft wide and 110ft deep, is being constructed. The two blocks will be

(*Continued at the foot of page 481*)

Tunnel-mouths in the central area (above); below is one of the four hangar-pens comprising the new B.O.A.C. maintenance building.

"Flight" photographs

(Below) Elizabethan servicing inside the completed section of the B.E.A. base. Viscounts will occupy the five uncompleted pens.



THE BRETAGNE ON VIEW

Twenty-fifth Production Machine Visits Gatwick

MOST present-day news of transport aircraft is concerned either with the future development of the new turbojet and turboprop machines for long-stage work, or, in gloomier vein, with delays in delivery of various contemporary types. It was a pleasant change, therefore, to attend the demonstration last week of an aircraft, of business-like performance, which is available almost immediately for delivery to operators. Further interest was added by the fact that this machine, which has certainly experienced its share of production delays, is a French type of which comparatively few details have been published in this country. The aircraft is the S.O.30P Bretagne, manufactured by the Société Nationale de Constructions Aéronautiques due Sud-Ouest, and distributed in Great Britain by Aerocontacts, Ltd., of Gatwick, the concessionaires.

The evolution of the Bretagne clearly demonstrates the modifications in performance and design made necessary by changing specifications. The basic conception was of a twin-engined pressurized aircraft intended for the transport of passengers and freight over short and medium distances (300 to 1,200 miles).

The first design in the series was the S.O. 30R Bellatrix, with S.N.E.C.M.A. 14R Gnome Rhône engines and a single fin and rudder, designed during the war occupation by an S.N.C.A.S.O. team under M. Parot. An order for 40 aircraft was placed in 1945, and the Bellatrix first flew in November of the following year. Since that time, a large number of modifications has been made to the original design, due mainly to the introduction of the I.C.A.O. performance regulations concerning flight on one engine, and to the changing equipment produced by the manufacturers and required by the French Technical Service and the airlines.

The most important external changes were the replacement of the French engines by Pratt and Whitney R-2800 Double Wasps, and the fitting of twin rudders, the resulting design being known as the S.O. 30P Bretagne. Two models have been produced, Mks 1 and 2, powered by R-2800 B.43 and CA.18 engines respectively and, in addition, Rolls-Royce Nenes were fitted to one airframe for experimental turbojet operations. To date, about 35 aircraft have been completed (all but five of which are flying), and the production order for 40 is expected to be completed by February of next year.

The first Bretagne to enter airline service did so in November 1950, when Iranian Airways introduced the type on their Paris-Bombay route. Since then, Bretagnes have commenced operations with Air Algeria, Air Maroc and S.T.A.E.O. (Société de Transports Aériens d'Extrême-Orient, flying internal Vietnam routes), and a specially fitted version has been presented to the President of the French Republic, M. Vincent Auriol. Another special version, a flying classroom, is being prepared for the Civil Aviation School of the French Ministry of Transport, and it is reported that the French Air Force, also, is interested in the aircraft for transport duties.

From the operator's point of view, the Bretagne is seen to be in the same general class as the Airspeed Ambassador and the Convair 240 (which, indeed, uses the same type of engine), although it is slightly smaller than both of these. Cruising speeds and ranges of these three types are respectively similar, while the Bretagne lies between the Convair and the larger Ambassador in passenger-carrying capacity. Typical performance curves for the Bretagne Mk 2, showing variation of cruising speed with height, and of payload with stage-length, are given on page 481.

At Gatwick last week, a brief visit by F-WEHC, the 25th production machine, for ground inspection and flight demonstration, had been arranged by Aerocontacts, Ltd. The tubby, compact fuselage gave a misleading first impression of smallness; one queried whether the quoted

The circular section of the fuselage is well shown (left), looking aft along the main passenger compartment. Twin strip-lighting is fitted to the ceiling. The orderly cockpit layout (right) has the engineer's controls on the starboard side; flap and undercarriage selectors are above the windscreen.
"Flight" photographs

SEA HAWK

. . . fighter of the Jet-Age Navy!

Here is the look of the Jet-Age Navy . . . sleek, streamlined, purposeful. For here aboard H.M.S. Eagle, Britain's most modern aircraft carrier, flies Britain's most modern naval jet fighter, the superlative Hawker Sea Hawk. Lightning fast and loaded with real fire-power bite, the Hawker Sea Hawk has long range and is smoothly-easy to take off and deck land. Pilots and ships crews alike agree that this is the carrier-borne strike fighter at its very best . . . an aircraft truly worthy of Hawker's traditional supremacy in fighters.

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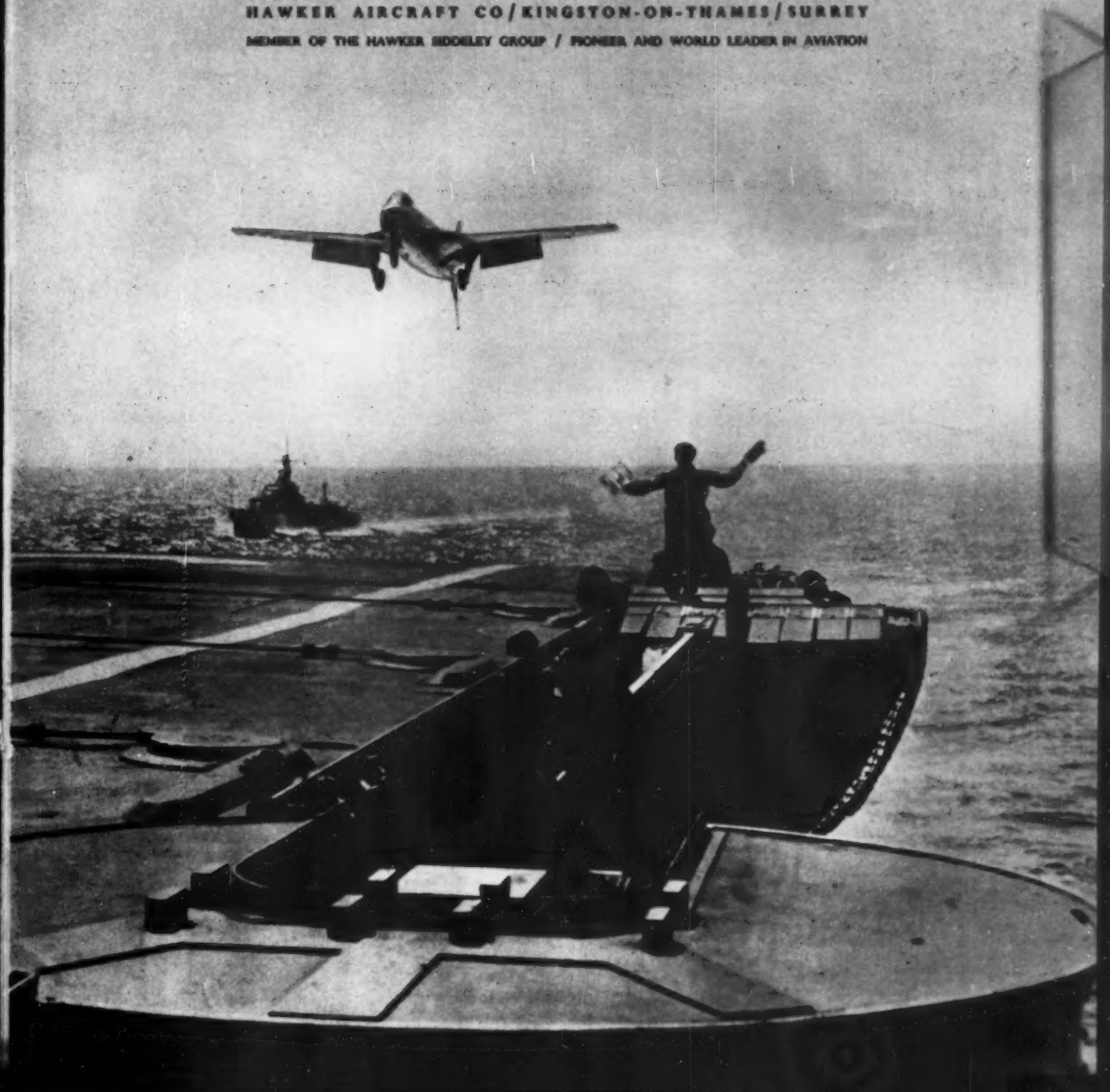

Avro 698...World's First Delta Bomber

Universally acclaimed as the outstanding aircraft of the year, the Avro 698, world's first Delta bomber, brilliantly fulfils the immense promise of the Delta Wing Planform. A triumph alike of British research and aeronautical engineering, it is to go into immediate production for the R.A.F.

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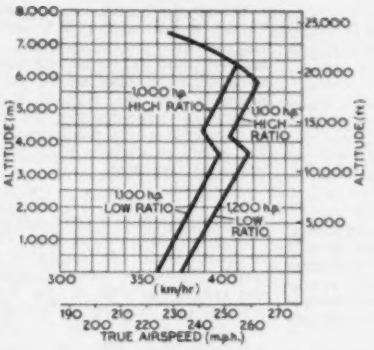
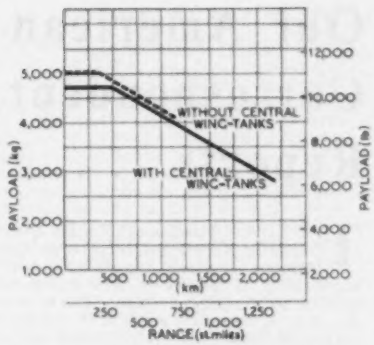
THE BRETAGNE ON VIEW . . .





Typical performance-charts for the Bretagne Mk 2. (Left) Cruising-speed variation with flight altitude for alternative engine settings (both engines operative) at all-up weight of 40,800 lbs. (Right) Payload-range characteristics with and without extra wing-tanks, assuming A.T.A. fuel reserves and a take-off weight of 44,370 lb.

43 passengers could be accommodated. Yet in fact the arrangement is of ample size for comfort, even in this, the so-called "coach" version (a 30-seat luxury version is available to special order).

The crew compartment seats four, although in airline service a three-man flight crew of pilot, engineer and radio operator/navigator only is carried. The passenger cabin is divided into two, the forward section seating 12 and the rear section 31. The passenger seats, which face forward, are easily removable, making possible additional freight space when the full passenger complement is not carried. There are three freight holds in the fuselage, beneath the passenger cabin, and additional compartments in the wing centre-section, which can carry either 71 cu ft of freight, or 375 gallons of extra fuel (in flexible tanks). The main integral fuel tanks in the wings, outboard of the engines, carry 690 gallons.

The Mk 2 Bretagne photographed at West Malling—whence it flew from Gatwick—during the demonstration-flight programme. Noticeable points are the large nosewheel, the twin loop-aerial domes for the two radio compasses and the short transmitting and receiving aerials (beneath the wing) for the radio altimeter. "Flight" photograph

In the air, the performance and handling qualities seemed good. Spring tabs on the rudders, and aerodynamic balance surfaces, ensure that the rudder and stick forces are not excessive. Effective trimmers enabled the pilot, M. Dabos, to fly hands-off in level cruise at 170 m.p.h., and in a climb at 160 m.p.h., with the starboard engine stopped. The noise level was not uncomfortable, but was higher in the forward passenger compartment than in the rear.

The landing circuit was made at 180 m.p.h., and the tricycle undercarriage and Fowler-type flaps were lowered at 160 m.p.h. and 140 m.p.h. respectively. A normal approach was made at 120 m.p.h. With some 16 passengers and spare equipment aboard, the landing run was short, even without the additional braking power from the reversible-pitch Hamilton Standard Hydromatic airscrews. The pilot's view is clear, and control is good while taxying; when the control column is locked, for straight-line taxying, only a quarter throttle can be given, as a safety precaution.

As mentioned, the aircraft possesses, but does not markedly exceed, the general performance characteristics of British and American types of similar size and power. The agents believe that, apart from its technical merits, the main attractions to operators are the short delivery time of six months and the competitive price. The Mk 1 costs £130,000 and the Mk 2, which was demonstrated at Gatwick, £155,000.

* **Loading Data.**—Span, 88ft 2in; length, 62ft 2in; height, 16ft 1in; gross wing area, 925 sq ft. Power plant: (Mk 1), P. and W. R-2800 B.43; (Mk 2), P. and W. R-2800 CA.18. Disposable load: (Mk 1), 11,690 lb; (Mk 2), 13,290 lb. Max. gross weight: (Mk 1), 42,170 lb; (Mk 2), 44,370 lb.

WORLD AIR GATEWAY . . . (Continued from page 479)

joined at one end by a main stores building, to which access will be given by a central road between the blocks. The B.O.A.C. base will consist of four hangar pens, each 300ft wide by 140ft deep, with workshops, offices and stores between the pens.

Maintenance of foreign operators' aircraft will take place in No. 2 area, which covers 72 acres. Two hangars are already in use here—the Pan American Airways steel building, capable of housing one Stratocruiser, and a three-bay aluminium hangar at present being used by B.O.A.C. for Comet maintenance. Provision for stores, the main fuel installation of the airport, and overhaul facilities for vehicles and other ground equipment, is made in No. 3 maintenance area, which covers 91 acres.

The airport's system of triple parallel runways, which was originally recommended by an M.C.A. advisory panel in 1945, has proved successful, and it is not now likely that the proposal to construct a third triangle of runways north of the Bath Road will be adopted. Instead, if the increase in traffic so demands, two more divergent runways will be laid in this area, which is at present classified as "safeguarded for future development." Using two runways at once, however, the present system is capable of handling at least sixty take-offs and landings hourly, and this capacity may be adequate for some time. It has, in any case, been guaranteed that no work north of the Bath Road will begin until mid-1955.

London Airport at present covers 2,784 acres (some 4½ square miles) and has a staff of nearly 800, most of whom are employed on telecommunications. It is owned by the Ministry of Civil Aviation, and its administration is in the hands of the Commandant, Air Marshal Sir John D'Albiac, who is responsible for providing the air-traffic, meteorological and other facilities that are given in exchange for the landing fees paid by some 23 scheduled airline operators. Airlines using the airport arrange their own schedules in accordance with a "capacity plan" laid down by the L.A.P. authorities some six to eight months ahead. Among the Commandant's most urgent problems at the moment are those of stretching the capacity of the hutted terminal area, of noise (much of his time is spent in replying to letters and telephone calls from irate residents in the surrounding area), and of devising methods of decreasing the time spent by passengers in transit between city terminal and aircraft. As the manager of Britain's premier airport, Sir John was well qualified to deliver the following advice to a group of aerodrome owners during a recent visit: "If your plan for a new airport looks adequate, double it, or the volume of traffic will overcome its facilities."

Our American Correspondent Reports . . .

THE S.B.A.C. Farnborough Display always has a strong, if sometimes emotional, effect on the American aircraft industry. It generally sparks off a series of statements and rumours all designed to offset British publicity and to build up the American position. This is quite understandable, but the drive often seems to be directed more towards the general public than to any technical audience.

This year was no exception. The statements ranged from estimates by manufacturers as to when they expect their new transports to fly (the most optimistic : Boeing by 1954) to letters from airline presidents giving all the reasons why they don't want jets yet, or how much they'd like them but can't get them because the British won't get on with the job. One airline executive made the remarkable suggestion that B.O.A.C. could afford to lose money on Comets "because their urge to be self-supporting is not so direct as our own," but did admit that jet power seemed to be a natural development for the future, though it was not "just around the corner." This, of course, was his opinion, but he seems to have been looking round a different corner from Mr. Rickenbacker, who wanted them by 1956.

The magazines also got into the act. *Time* gave a good report on the Comet but said, "Rickenbacker's time-limit was hard for the leisurely Britons to meet," and "It seemed to be a golden opportunity for the British to grab a big chunk of the U.S. commercial plane market. But last week it looked as if the British had muffed the opportunity." Rickenbacker himself said, "If I were an Englishman I would work day and night—including week-ends—to keep the advantage they have." *Time* finished up by saying, ". . . the U.S., which has trailed the British in jet engines, is fast catching up. While the British have only limited production of their best jet engines, Pratt and Whitney is now ready to mass produce its powerful J-57; Westinghouse is getting ready to do the same with its J-40. And while U.S. plane builders have built no jet transports they are gathering plenty of experience with the big jet bombers. . . . If the British cannot take advantage of their transport lead now U.S. builders may soon overtake them." Admittedly this comes from a magazine which likes to cover technical fields with the same imaginative sort of prose that it applies to, say, crime or politics; but however inaccurate these statements may be, they are read, and perhaps believed, by a lot of people outside as well as inside the States.

• • •

OBVIOUSLY, the earlier the delivery dates, the more chance there must be of selling British turbines here in America, not only to the international carriers for use on those routes where they are in direct competition with B.O.A.C. but for domestic use as well. At one time pretty well everybody one met pooh-poohed such possibilities, but today—to this writer, anyhow—there does seem more than a 50-50 chance that an American operator (or even operators) may buy British equipment, or perhaps work out some sort of exchange or hire deal in order to be the first to use turbine aircraft. It's impossible to say who may do this—if it is done. Eastern, National and Pan American have, at one time or another, shown more than a passing interest, and the last-named would have the added opportunity of being able to buy such types through one of its South American subsidiaries. But whatever transpires, it seems likely that the present Rickenbacker offer is designed more as a holding operation, with the added advantage that it will light a pretty hot fire under the American manufacturers, and will also force Governmental action when Congress reconvenes.

Behind the scenes much more is probably going on. United Airlines and T.W.A. are not going to allow their competitors to get a jump ahead. And although the dam of national pride still stands, the water is seeping through and undermining the foundations. Once there is a break, neither Congress nor the Aircraft Industries Association nor hindrances in the granting of Certificates of Airworthiness or permits, nor even public opinion is going to stop it. But the weight of water is likely to be dependent on British production schedules.

• • •

THERE has been a great deal of accusation and counter-accusation here about delays in rearmament, particularly in the Air Force. A Senate sub-committee came out with a terrific blast at the Administration for its decision to delay the completion date of the 143-wing Air Force, now scheduled for mid-1955. They suggested that the stretch-out on time was due more to failures to meet production schedules rather than for economic or strategic reasons. The committee also had a crack at both the Pentagon and the Government. They said that "the root cause is a capacity for indecision which at times has reached an amazing level."

Any objective observer of the scene might, with reason, wonder whether partial cause of this apparent indecision didn't lie in the methods of some of the Senate sub-committees themselves. No Air Force officer or civilian administrator fancies the idea of being hauled up in front of an investigating Senate sub-committee, perhaps two or three years after the event, and having his reputation broken because of decisions that he made at a time when they seemed wise and reasonable. History can so easily turn any decision upon itself and a Congressional investigating committee—wise in the light of subsequent events—is seldom over-generous to the poor unfortunate who made a bad guess.

But this particular report is likely to stir things up on a policy level as well, for it also recommends a certain freezing of design, and by so doing may add some weight to the Aircraft Production Board's suggestion (referred to previously in these columns) that many types of both engine and airframe be abandoned, and the total resources of the industry be concentrated on a few carefully selected models.

In this connection it was reported from Washington on September 13th that the U.S. Air Force had ordered 11 new models of jet fighters and bombers into production to replace existing types. Actually some of them are scarcely "new," but this is the first semi-official announcement that they are in quantity production. They include the McDonnell F-101, the North American F-86D, F and H, the Northrop F-89D (which is fitted with wing-tip rocket pods), and the Lockheed F-94C and Republic F-84. The bombers are reported to include the Boeing B-52, Canberra B-57 (if this is correct it is good news, as the fate of this aircraft has been in some doubt), and the Douglas RB-66, which is an Air Force version of the Naval A3D. The emphasis on all-weather rocket-firing intercepter fighters is interesting.

Governmental reaction to the sub-committee's remarks was also strong. On September 19th the Under-Secretary of the Air Force said, ". . . It is scarcely accurate to characterize as a failure a production programme that is actually meeting its planned schedule." He also suggested that this schedule was an adequate one, *unless* it was viewed as "sufficient to stockpile for the all-out war we are trying to prevent." In other words, and if he was reported correctly, the Under-Secretary was saying that the present production programme was designed to meet a long period of "cold-war" activity rather than any immediate shooting war. If this is so, it may represent a change in emphasis in American policy, and may indicate a greater acceptance of the European belief that an immediate war is less likely than a long-drawn-out period of political and propaganda aggression.

• • •

ONE of the less attractive aspects of life in the United States today (to the visitor, anyhow) is the ubiquity of canned music. It is everywhere. In restaurants, in bars; in waiting-rooms; and even in public transport vehicles. It blares at one from loudspeakers, all across the nation. It is

Our American Correspondent Reports . . .

often loud enough to drown conversation, and there must be many people who find it intensely irritating. In fact, not long ago considerable resistance arose from a "captive audience" of commuters and other travellers when the railways tried to introduce the broadcasting of music, plus the usual commercials, at one of New York's stations. The outcry was immediate, vociferous and effective, and gave victory to the captives (which was more than it did in Washington where, as a result of a local Court decision, broadcasts are permitted in the city-owned buses).

And now the threat has apparently been extended to civil aviation. Already the physical means are available. Most of the new transports have loudspeaker systems, through which the crew are apt to give cosy little chats during the trip. Undoubtedly, there are a number of passengers who like to hear about the scenery, but the writer is sufficiently misologistic to hate it. As far as he is concerned, such broadcasts should be confined to safety briefing, the flight plan, the weather and "Fasten your seat belts, please." Anyhow, it was through this system that the canned music was to be inflicted.

But luckily it was discovered that the poor pushed-around public had likes and dislikes of its own. In recent issue of the journal quoted above, there was a resume of some of the domestic airlines' comments on the subject. From this it transpired that—unlike some of their surface-transport cousins—not only had they actually asked their passengers what they thought, but were prepared to accept the public's reaction. This was that the customers weren't interested, and in some cases actually disliked the idea. One airline said rather sadly that "a fine installation could be made and it was too bad nobody wanted it." Yet another carrier—bowing to his bread and butter—decided that perhaps the aeroplane was one of the few places left in the world today where a person could do nothing but think and rest and that there was, in fact, a high percentage of the travelling public who actually wished to be left undisturbed.

As we are certainly numbered among that percentage, we trust that Music While you Fly has received a setback from which it will never recover.

EYES, SPEED AND ALTITUDE

THE following informative observations on modern air-fighting tactics are extracted, with permission, from Vol IV, No. 4, of the U.S.A.F. "Air University Quarterly Review." It is emphasized that the opinions expressed are those of the authors—Lt. Col. Glen T. Eagleston and Lt. Col. Bruce H. Hinton—and are not to be construed as reflecting the official opinion or policies of the U.S.A.F. or the Air University. It should, incidentally, be recognized that recent American developments—details of which are as yet undisclosed—may, to some extent, have altered the picture since the original article was published in America.

A COMMON statement among fighter pilots is the often quoted, "I'll never get shot down by one I can see." While this statement is open to argument, the most important factor in air-to-air combat between fighter aircraft still is seeing the enemy. In an engagement between high-speed jet aircraft the techniques which were proved in reciprocating aircraft have again been found essentially sound. The exception is in changes imposed by the limitations of the fighter pilot's eyes.

Since the advent of the F-86 in the Korean air war, fighter-versus-fighter combat has been conducted at speeds and altitudes far greater than ever before. The inherent problems of jet fighter warfare were found to be the same as for all tactics in fighter aviation, and the devising of attack and defence methods centered on overcoming the difference made by the new conditions.

Speed, the salient characteristic of the modern fighter airplane, has imposed the stiffest challenge to both the security of the fighter force and the judgment of the pilot. Combat speed of 500 to 650 miles per hour has almost doubled the fighting speeds to which pilots were accustomed, and the high rate of closure of attacking aircraft approaching from abeam, around the front quarter to head-on, skyrocketed their difficulties.

Recognition of an attacker or of an enemy fighter force at the maximum range of the pilot's vision yet leaves, with the high closing speed, little or no time for decision and action. In head-on passes between the F-86 and the Mig-15 the enemy has frequently been lost from sight while a turn was being made to engage. On several occasions the formations of hostile airplanes have flown through each other before either had seen the other. At a closing speed near 12 miles a minute this is understandable, yet it indicates the extreme alertness required of the pilots.

The problem of recognizing the Mig-15 attacking from abeam has shown that the closing speed necessitates immediate action upon sighting. Usually a fast-flying Mig formation is already a threat before it is identified. In some cases enemy attacks have been pressed home despite the fact that the U.S.A.F. formation leader saw the enemy attacking and broke into his attack. The high speeds of closing and of interception are deceptive and have caused many pilots to fall short on a turn into a Mig-15. Since the speed variation is generally between 500 to 650 kt, it is a safe assumption that the F-86 should be flying in that speed range. But frequent encounters where the Mig was flying at 400 kt or thereabouts proved that too much speed is as hazardous and profitless as too little speed.

Judging the speed of a jet is extremely difficult when it can vary between 400 and 650 miles per hour. The deceleration of an attacking F-86 is equally difficult if the target is doing some 150 to 250 m.p.h. less. The actual judgment of the speed of a Mig-15 passing below or level has been a severe problem.

An F-86 closing on a Mig-15 with a 50 m.p.h. overtaking speed requires about seven or eight miles to close from 5,000ft to 2,000ft for firing, assuming the target speed is high. In dives or with a longer distance to close, this distance can stretch and has stretched to 20 miles. Thus speed has made it almost impossible to localize an air battle and to maintain concentration of force. Once a fight begins between two planes, there is seldom any one person who can report having seen all or even most of it. The battle generally occupies an area covering 30 miles, at all altitudes from the ground up to 35,000ft or higher. Swirling dogfights, which usually start in one small area, quickly break up and separate into several fights, and often pilots who have been in the area of the many fights have reported not encountering anyone at all. With the speed and the high operating altitudes of these airplanes, the battles have been extended greatly in depth and the area covered has been more than doubled. Tactics have had to be adapted to meet these handicaps.

Another problem in jet-fighter operations is sighting the enemy at high altitudes against the background of dark sky. Here the ranging of a pilot's eyes can be at fault. At high altitudes and except when the sun's rays are glancing directly off an airplane, the reflection of the deep blue sky serves as an effective camouflage. If eyes are not ranged exactly upon the aircraft distance, no sighting is made. Attacking aircraft can slip in without recognition until they are within dangerously close range.

All this enlargement of the sky area to be covered by the eyes of the jet fighter pilot has not enabled him to see any farther. Consequently targets in the same piece of air but separated by 15,000ft to 20,000ft in any direction are likely to be missed, particularly since they are in the area very briefly.

F-86 pilots trying to cover the sky at all points of the clock at all levels, and at varying ranges, have found how easily they can be surprised. The elements of speed, altitude and eye ranging often combine to present a firing Mig-15 at five o'clock when the pilot has just finished clearing himself in that direction. It happens often enough to be considered a probability of jet air fighting.

It is recognized that these factors are not unusual and that even their more limited presence in air fighting during World War II was a threat. But their accentuation by greater speeds and higher altitudes has served to emphasize the limitations of the human eye.

JET FIGHTER

In supersonic black the demon flies,
Thrusting to the summer sun,
Away from watchful eyes;
Up where vapour trails in cloudlike wakes
Follow as a tracer would,
Each move the pilot makes.
Now high-speed climbing rolls, then Mach One dives,
Screaming as some devilish thing;
A thing that Satan drives.

He is no devil though up there, my friend,
Flying free from earthbound care,
No fool to comprehend,
But just a daring man who likes to fly
Above the patchworked land,
Beneath an azure sky.

T. C. H.

Research for Industry

The Aims of the Fulmer Institute: Its Founder Commemorated

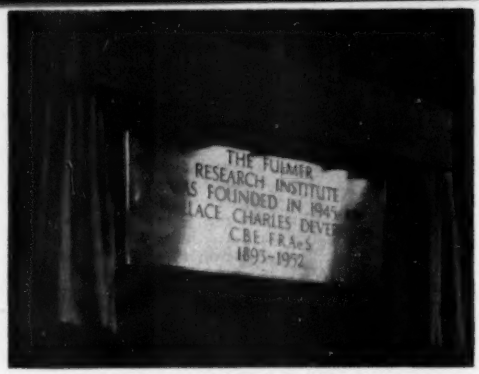
IT is an unfortunate fact that, as a recent official report states, "Striking examples can be cited of manufacturing operations which, though having their origin in this country, have been left to other countries to develop or modernize, with the result that they are now operated here under foreign licence or in plant either purchased from abroad or constructed to foreign design."

It was to combat such tendencies that the late Col. W. C. Devereux, C.B.E., founded the Fulmer Research Institute in 1946. Although such establishments have been a great asset to the U.S.A. and Germany for many years, the Fulmer laboratory is understood to be the first attempt at sponsored research to have been made in the United Kingdom. Its aim is to enable any organization with an industrial technical problem to hire a first-class team of research workers, complete with their equipment.

In the five years that Fulmer has been in use the staff has been doubled and the income has trebled. About half the income comes from Government departments for defence research; but this is by no means an unusual feature of such sponsored research establishments. All kinds of industrial concerns, including some dozens of private firms, have availed themselves of the comprehensive facilities offered. The work at Fulmer has included such diverse fields as: recovery of metal residues from fluxes; metal-ceramic aggregates; refining of beryllium and titanium; friction and wear between yarns and metals; design of boxes for the transport of fish; and the catalytic distillation of aluminium.

The Institute distributes no dividends to shareholders and receives no grants from the Government. The work undertaken frequently results in a process or apparatus being patented; 88 patents, both at home and abroad, have already been applied for on behalf of sponsors.

A memorial plaque was recently erected at the Institute in commemoration of the founding of the establishment by the late Col. Devereux, who died in June of this year. As we briefly reported last week, the plaque was unveiled on September 30th by Sir Archibald Rowlands, G.C.B., Permanent Secretary, Ministry of Supply. During the ceremony, the director of research at Fulmer, Mr. E. A. G. Liddiard, M.A., F.I.M., paid a personal tribute to the founder, with whom he had worked for some six years.



The memorial plaque is of simple and dignified design.

"The finest memorial to any man," he said, "is the successful continuation and expansion of the work that he started during his life. I think this is particularly true in the case of the Institute. . . ." Mr. Liddiard later turned to what he termed the "least satisfactory" side of the picture, namely, support from British industry. He admitted "somewhat ruefully" that the value of sponsored research was more fully recognized on the other side of the Atlantic, and read a letter from an American sponsor illustrating the high regard in which the Institute was held in the U.S.A.

He continued: "By the contacts that we have established and the reputation that we enjoy in the U.S. and Canada, we are able to offer to British sponsors the possibility of exploiting their research results on a much wider scale than would be possible if we confined our activities strictly to this country or, indeed, to the British Commonwealth."

MARCONI APPOINTMENTS

LAST week, Sir George Nelson, F.C.G.I., M.I.Mech.E., M.I.E.E., head of the English Electric group, announced that Sir Noel Ashbridge, B.Sc., M.I.C.E., M.I.E.E., F.K.C., F.I.R.E., the B.B.C.'s director of technical services since 1948, has joined the board of Marconi's Wireless Telegraph Co., Ltd., Marconi International Marine Communication Co., Ltd., Marconi Instruments, Ltd., and English Electric Valve Co., Ltd.

Sir Noel, who was knighted in 1935 and is now 63 years of age, retired from the B.B.C. in July, 1952. After Army service in World War I he joined Marconi's Wireless Telegraph Co., Ltd., and was head of their experimental broadcasting station at Writtle for several years; during this time he co-operated with Capt. P. P. Eckersley. In 1926 he rejoined Capt. Eckersley (then chief engineer of the B.B.C.) as his assistant. He took over as chief engineer in 1939 and subsequently occupied a succession of B.B.C. senior posts.

W/C. Stanford-Tuck.

Dr. O'Kane.

Other Marconi news concerns appointments in the company's aeronautical division, which, formed after the First World War, has been under the management of Mr. L. A. Sweny since 1936.

The aeronautical division was formed as a separate unit of the company after the First World War, in order to design radio to meet the growing needs of civil aviation. Mr. L. A. Sweny has been its manager since 1936, except during his period of service with the Fleet Air Arm between 1942 and 1946.

In connection with the present reorganization, Dr. B. J. O'Kane, Ph.D., B.Eng., A.M.I.E.E., has been appointed chief air radio engineer; he took over his new duties on October 1st. Dr. O'Kane graduated as Bachelor of Engineering (with first-class honours) at Liverpool University, and two years later was awarded a degree as Doctor of Philosophy at the same university. From 1935 until 1941 he worked for the General Electric Company, at their research laboratories. In 1941 he was seconded to the Telecommunications Research Establishment at Malvern, where he remained throughout the war years, and later returned to G.E.C. Since 1947, and until his new appointment, he was Chief Engineer of International Aeradio, Ltd. He has contributed articles to *Flight* from time to time.

W C. R. R. Stanford-Tuck, D.S.O., D.F.C., the well-known Battle of Britain pilot, who joined the company in 1949, is now appointed sales manager of the division, and Mr. F. Wheeler, who has been with the company since 1918, becomes contracts manager.

FOR INSTRUMENT-TESTING

Many temperature-actuated types of instrument can be tested with this equipment, supplied to B.E.A. by Rollason Aerocessories, Ltd., of Croydon Airport. It makes use of a specified oil, brought to the required temperatures (ranging up to 300 deg C) by an immersion heater or cooled by an airflow through coiled tubes. The company—a new one in the Rollason organization—specializes in the design and manufacture of test equipment.

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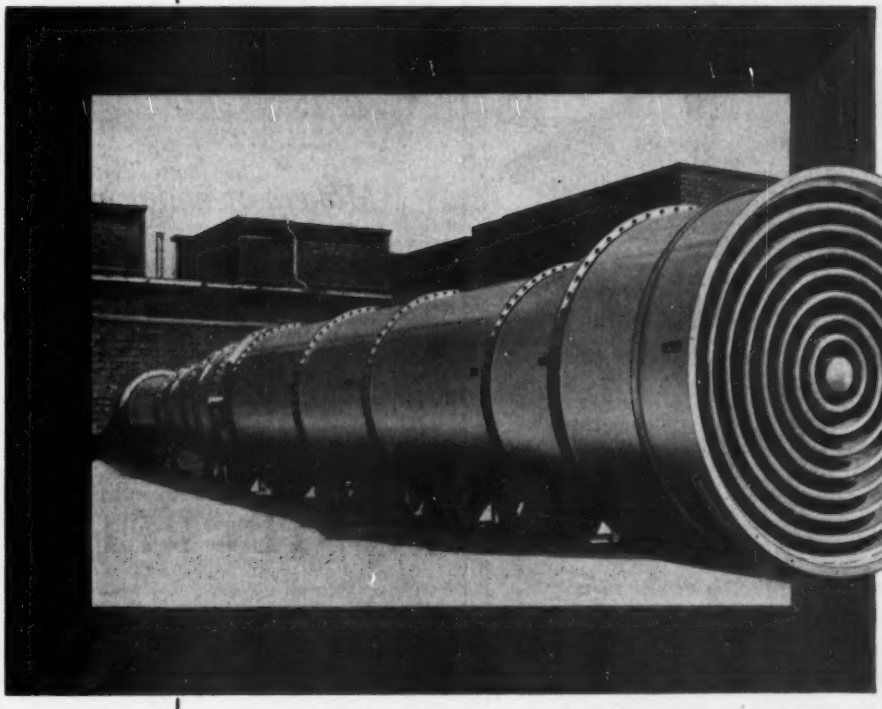

Contracts include silencing of the following: Avon, Nene, Derwent, Sapphire, Ghost, Goblin, Python, Mamba and leading American Engines.

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CIVIL AVIATION

PLAN FOR SAN JUAN: As reported below, the new Puerto Rico airport at Isla Verde is expected to open next year. This artist's conception shows the planned layout of the completed terminal, which is likely to be the scene of the next I.A.T.A. Technical Conference.

GATWICK PLANS

PROPOSALS for the development of Gatwick Airport were announced by the Ministry of Civil Aviation on Monday. Movements in the London area, it was stated, would be doubled by 1960, and London Airport would be unable to meet all future demands. Apart from this, there was a need for an alternative which could also be used as a base for some southbound air services. Gatwick had been chosen from over 50 sites—both existing airfields and undeveloped sites.

As planned, Gatwick would have two 7,000ft runways, 200ft wide and 3,200ft apart, running parallel from east to west. The northern runway would be completed by 1956, by which time the severed section of the London-Brighton road would have been replaced; completion of the other runway would not begin before 1958. New terminal buildings would be situated between the proposed runways near the Gatwick Racecourse station.

The Ministry states that its proposals were explained to representatives of the local authorities concerned at a meeting held in London on Monday. Representatives of the Ministries of Transport and of Housing and Local Government and of the Crawley New Town Development Corporation were present.

GERMANY'S AIRLINE

PRACTICAL work on the formation of the new Lufthansa will, it is reported, begin next spring, following the West German Cabinet's recent approval of a grant of six million marks (£510,000) towards the initial cost. According to a reported statement by Dr. Seebohm, Minister of Transport, the new airline would be financed at first by national and municipal funds and later by private enterprise. Favourable offers of used aircraft, he said, had already been received and one of the first steps would be to buy 30 aircraft—15 twin-engined machines for internal routes and 15 four-engined airliners for international services. It was proposed to run services to North and South America, South Africa and the Far East.

Dr. Seebohm was among the 750 German passengers carried on demonstration flights by the prototype Vickers Viscount 700 during its recent tour of Western Germany and he confirmed the many earlier comments on the aircraft's smoothness and general passenger appeal. During its tour the Viscount gave a total of 18 demonstration flights at Cologne, Stuttgart, Munich, Frankfurt, Hamburg, Hanover and Dusseldorf. Sir Hew Kilner, Vickers-Armstrongs managing director and Mr. R. C. Handasyde, the company's sales manager, were among those on board the aircraft, which was captained by W/C. George Lowdell. Ex-Luftwaffe pilots were among those who handled the controls.

SABENA'S YEAR

IN its recently published report for the year 1951 Sabena, the Belgian national airline, announces that its production, expressed in T/km available, went up by 28.3 per cent to 52,481,334. Compared with the figures for the previous year passenger, freight and mail traffic increased by, respectively, 12 per cent, 65 per cent and 39 per cent. Revenue earned by the company totalled £8.7m, an increase of over £2m on the previous year's receipts; this 31.6 per cent increase in revenue was accompanied by a 21 per cent rise in costs. After deductions the net profit available for distribution was £361,548.

Sabena's fleet, which carried 260,000 passengers over a total distance of nearly 12m miles last year, includes five DC-6s, seven DC-4s, six Convairs, 24 Dakotas, four Doves and three Bell 47 helicopters. On order are eight DC-6Bs and two DC-6A cargo aircraft.

REGIONAL QFFs DISCONTINUED

IN accordance with the recommendations of the recent European and Mediterranean Regional Air Navigation Meeting, the procedure of setting altimeters according to the regional QFF (barometric pressure reduced to mean sea level in a given region) is to be discontinued. As from November 1st, this system will be replaced by one of flight-separation using the spot QNH (altimeter setting at a given place) values of 12 designated stations situated throughout the United Kingdom. These settings will be used only for the purpose of vertical separation. Details of the new procedure are given in *Notam No.* 546/1952.

THE I.C.A.O. ALPHABET

THE new I.C.A.O. phonetic alphabet came into full use on October 1st. For the past year it had in fact been used by M.C.A. ground stations, but pilots could request the use of the old alphabet if they so desired—which most did. In a recent circular, the M.C.A. emphasize that effective criticism is impossible without practical experience in the use of the new alphabet, and that so far, such experience is lacking. Operators are requested to send constructive comments, during the first few months of the alphabet's general use, to the Ministry.

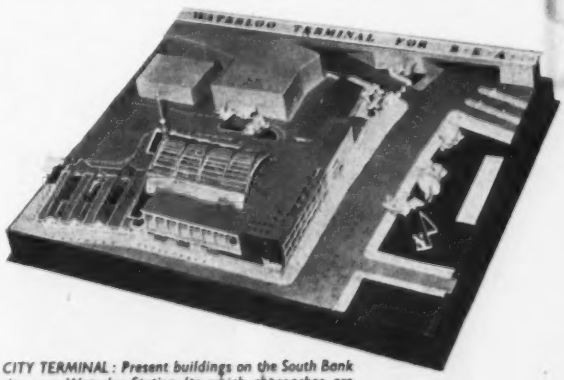
Alfa	Juliett	Sierra
Bravo	Kilo (Kee-lo)	Tango
Coca	Lima (Lee-ma)	Union (or Oonion)
Delta	Metro (or May-tro)	Victor
Echo	Nectar	Whiskey
Foxtrot	Oscar	Extra
Golf	Papa	Yankee
Hotel	Quebec (Kibbeck)	Zulu
India	Romeo	

The emphasized syllable is underlined.

PUERTO RICO'S NEW AIRPORT

TO relieve congestion at the Isla Grande airport in San Juan, capital of Puerto Rico, and to prepare for the larger and faster aircraft expected in future, an extensive new terminal is being constructed at Isla Verde, just outside the city. Initial construction, under the supervision of the Puerto Rico Transportation Authority, should be completed during 1953, although extensions are subsequently to be made.

The first of the two runways, 1¼ miles in length, has now been virtually completed, together with taxi-strip; next items are expected to be the parking apron in front of the terminal site, and the passenger terminal building itself. The cost of the complete



CITY TERMINAL: Present buildings on the South Bank site near Waterloo Station (to which approaches are seen on the right) will be modified to form B.E.A.'s new city terminal, which will have a capacity of 14,000 passengers daily.

CIVIL AVIATION . . .

project is estimated at 16 million dollars (approximately £5.7m).

The existing airport at Isla Grande has accepted a constantly increasing amount of passenger and freight traffic since 1948, and is now considered to be the busiest air terminal in Latin America. At present, an average of 1,000 passengers per day pass through the airport, and freight totals have increased more than fivefold during the past few years.

The insular position of Puerto Rico makes aviation the most suitable, and vital, form of transport, and the importance of the early completion of this new international airport is correspondingly high.

CHEAPER FLIGHTS TO SCOTLAND

DESCRIBED by Mr. Peter Masefield as the "lowest air rate per mile introduced in this country," B.E.A.'s new winter fares between London and Scotland will offer a saving on the first-class rail fare. Eight-day tickets between London and Edinburgh and London and Glasgow will cost only £8—two-thirds of the former fare. In addition to the regular Pionair services to Edinburgh, Glasgow and Aberdeen *via* Manchester, special direct Viking services to Glasgow will be introduced. Free coffee, tea and biscuits will be provided, but passengers will have to pay extra for tray meals, which will be ordered in advance. The new fares are expected to double traffic on the main air routes to Scotland.

NEW GREENLAND AIRFIELD

MESTERS VIG airfield—the first to be built on Greenland's east coast—is very different from the U.S.A.F.'s vast new $93 m west-coast air base at Thule. It has only a single gravel runway, 5,900ft long by 164ft wide, and was built in one month by local inhabitants. But its value should not be underestimated, because it is the main air supply base for important lead mines being worked in the district by the Nordic Mining Co.

First aircraft to land on the new airfield, on September 8th, was *Skyfaxi* (TF-ISK), one of Iceland Airways' small fleet of Catalina amphibians, which have been operating regular charter flights to both the east and west coasts of Greenland throughout the past summer. Twenty of these charters involved flying freight and employees of Nordic Mining to Mesters Vig, where the "Cats" alighted on a convenient fjord. Now, opening of the airfield means that deliveries can be kept up throughout the year, and Iceland Airways will be able to use DC-3s and, when loads are sufficiently big, their familiar DC-4 *Gullfaxi* in place of the less economical Catalinas.

THIRD COMET SERVICE

TUESDAY, October 14th, will see the inauguration of a third B.O.A.C. Comet route—between London and Singapore. The new service will bring this part of the Commonwealth to within 27½ hours of London. Flying time from London to Singapore will be about 20 hours (Argonauts operating this route at present take 2½ days to complete the journey).

Outward flights will be routed *via* Rome, Cairo, Bahrain, Karachi, Calcutta, Rangoon and Bangkok—a total distance of 7,761 miles. On the return flight from Singapore to London, which will occupy a total time of 34 hr 20 min (flying time 26 hr 20 min), an additional call will be made at Delhi.

The new service will operate on a weekly frequency in each direction until October 31st, when a second weekly Comet service, operating along a slightly different 7,892-mile route, will be introduced. This will call at Beirut instead of Cairo and at Delhi on the outward flight as well as the inward, but will not call at Rangoon. Total elapsed time for the outward flight will be 27 hr 25 min and the flying time will be 20 hr 25 min; the inward flight will take 32 hr 10 min, with 25 hr 10 min spent in the air.

The first service will leave London on Tuesdays, arriving in Singapore on Wednesdays, and leave Singapore on Thursdays, arriving in London on Fridays. The second service will leave London on Fridays, arriving in Singapore on Saturdays, and leave Singapore on Sundays, arriving in London on Mondays.

CHARTER NOTES

FOR the majority of Britain's independent air transport operators, the week ended October 5th was a thoroughly bad one. The fact that the aircraft of several airlines never left the ground on commercial flights was not the fault of the companies concerned; it just happened that for no apparent reason there were remarkably few immediate jobs to quote for. By way of contrast, however, one company experienced one of the best weeks in the operator's history, a fact entirely due to a large increase in the amount of Berlin-Hanover refugee traffic. In fact, of 112 charter flights completed, no less than 103 were carrying passengers and freight out of Berlin. In terms of distance, the week's work amounted to only 55,600 miles, 33,000 of it in Germany. Freight flights covered 26,000 miles and passenger flying accounted for 29,600 miles. In all, 420 tons of cargo and 2,300 passengers were uplifted; less than 100 of the passengers were flown from points outside Germany. Freight ton-miles fell to about 105,000 and passenger-miles increased to 545,000 (about 50,000 ton-miles).

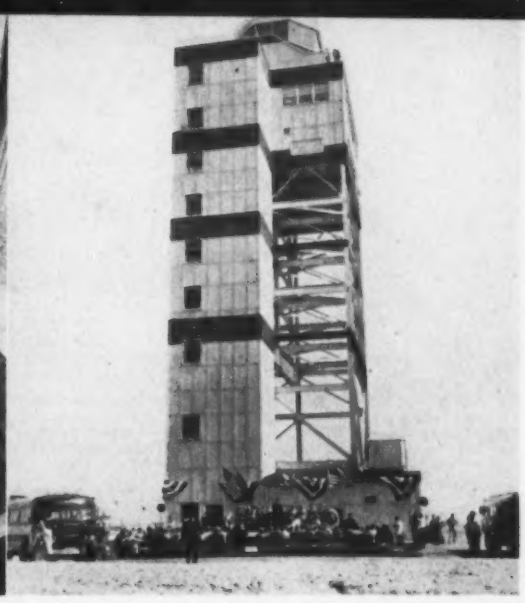
Yorks, flown solely by Air Charter in Germany, completed the greatest commercial distance with 22,500 miles to their credit. Bristol 170s and Dakotas drew level with just over 13,000 miles each and a solitary Viking brought up the rear with another 6,500 miles. Approximate revenue earned during the week was £26,000, and the hours flown amounted to 330. If business continues to slacken between now and the expected Christmas rush there will probably be some temporary reduction in charter rates; present charges naturally vary according to the requirements of individual jobs but, as a general guide, Yorks cost around 10-12s per mile, Bristol 170s, 8-10s, Vikings, about 6s 6d, and Dakotas, from 5s-6s 6d.

Two of the long-distance flights this week were to South Africa and the remaining one to the Middle East. Crewsair flew a Viking from Southend to Lusaka with 27 passengers and then positioned for a return trooping trip. Scottish Airlines completed one of their regular Dakota flights to Dukhan and back with freight for the Iraq Petroleum Company. B.K.S. Aerocharter, returning from a passenger flight to Johannesburg brought back a small Dakota-load of cargo. This company, incidentally, has just been allocated two ex-R.A.F. Dakotas by the Air Ministry. One should have been delivered by now and the other is expected very soon. It is the intention of B.K.S. to equip them as 32-seaters although, at a later date, one may be refitted as a luxury V.I.P. machine. The company has applied to the Air Transport Advisory Council for permission to operate a route system radiating from Newcastle; Dakotas based at this city will be very useful for the urgent movement of ships' crews and parts.

The only other reported charters were short-range trips by Silver City, whose Bristol 170s flew 11 tons of cream cheese and seven tons of periodicals across the Channel from Le Touquet to Lympne. Two Bristols also brought eight tons of stage equipment from Berlin to Blackbushe for an American theatrical company.

Silver City's main work was in Berlin, where they completed 33 round trips carrying freight, five tons at a time, to Hamburg and other large towns in Germany. Air Charter, with four Yorks now in Berlin, completed 28 cargo flights to Hamburg, each with an eight-ton load and 42 passenger trips to Hanover, each with 52 people aboard.

AIRLINE MEN IN THE NEWS: General Henri Ziegler (left) has been promoted to the rank of Commander of the Legion of Honour in recognition of his work since the war—notably as director-general of Air France. He is a former test-pilot with 2,000 flying hours to his credit. Dr. L. H. Slotemaker (centre) has just completed 25 years' service with K.L.M., of which he is executive vice-president (foreign relations). Mr. Gordon McGregor, president of T.C.A. (right), has been chosen as the 1953/54 president of I.A.T.A. He will take office at next year's annual meeting, which is to be held in Canada.



SKYSCRAPER: Valued at $1m, this 11-storey, 150 ft. high control tower was recently opened at New York International Airport (Idlewild). Its radio and radar equipment, accounting for over half the cost, includes 15 receivers, two five-channel transmitters and 75 telephone lines. In addition, it is claimed to be the first commercial control tower to use radar for detecting and controlling movements of aircraft on the taxi-tracks and runways.

BREVITIES

DURING the first eight months of this year, 532,000 overseas visitors arrived in Britain—3 per cent more than last year's total for the same period. The record month was August, when there were 107,000 visitors, of whom 28,000 came from America (29 per cent more than in August 1951).

* * *

Seven B.E.A. services to Europe were cancelled on October 2nd following a stoppage of work by maintenance staff, who were holding discussions with their union on the question of night-work. An indication of the disastrous effects of airline employment disputes had been given a few days earlier, when the B.E.A. annual report was published; it was revealed that a go-slow strike had cost at least £150,000 during the last financial year.

* * *

Forty-seat versions of the Douglas DC-6B completely equipped with Sleeperettes were introduced on the New York-Johannesburg route by Pan American Airways on October 2nd. They replaced Constellations, which had taken six and a half hours longer for the 8,550-mile journey, now completed by the DC-6Bs in 43 hours.

* * *

It is now possible to fly from England to France (on Silver City Airways' Lympne—Le Touquet route) for only £2 single and £4 return. The company announced on September 30th reductions of 10s in the single and return fares for passengers not accompanying vehicles on the car ferry service; it will be remembered that fares for cars, motor cycles, cycles and passengers accompanying them were reduced by up to 50 per cent on September 15th.

* * *

As from Monday next, October 13th, the London School of Air Navigation will occupy larger premises, at 33, Ovington Square, Knightsbridge, London, S.W.3 (Tel. Kensington 8221). This move to a larger London house has been brought about by an expansion in the school's activity—teaching for all professional pilot and navigator qualifications.

* * *

In his annual report for 1951 Mr. H. M. Johnston, Director of Civil Aviation in Nyasaland, reports that lack of funds, shortage of skilled personnel and both technical and domestic accommodation prevented the expansion of ground services, thus retarding the growth of air services. He adds that British sources have not yet met the Protectorate's requirement for small twin-engined all-metal aircraft carrying four to five passengers and having satisfactory single engine performance and an all-up weight in the region of 4-5,000 lb. In consequence, single-engined Beavers were being used over routes which had previously been considered most unsuitable. Increases in operating and maintenance costs caused private flying in Nyasaland to come to a full stop during the year.

The 16 Dakotas of J.A.T., Yugoslavia's State airline, are reported to have flown 1,350,000 revenue miles and to have carried 86,661 passengers during 1951, compared with 1,119,000 miles and almost the same number of passengers flown in 1950. Orders for three Convair 340 aircraft have been placed by the company, which recently took delivery of two Hiller 360 helicopters for pest-control purposes.

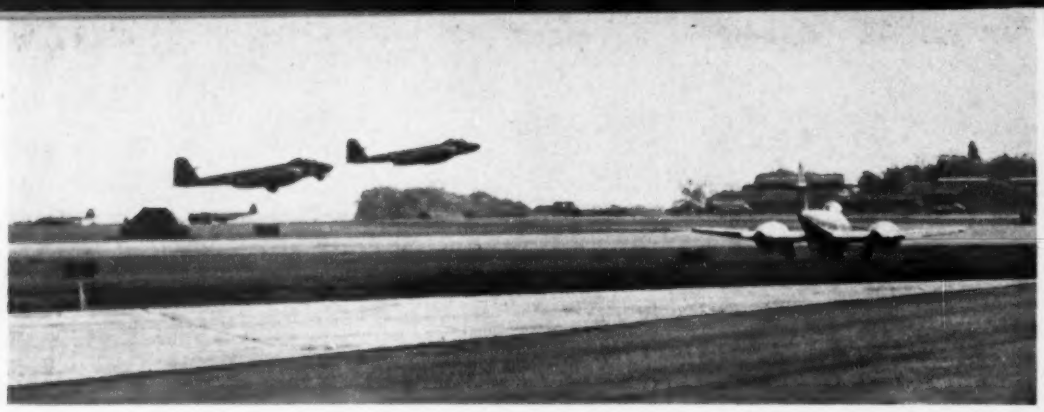
* * *

Two new services over the North Atlantic will be inaugurated by S.A.S. on October 26th—the "Royal Viking" luxury flights and "Globetrotter" cut-fare services. The former, operated by 34-seat DC-6Bs, will fly non-stop between Prestwick and New York and the 60-seat "Globetrotter" DC-6s will make a short refuelling stop at Gander. Between them, the two services will provide seven weekly flights to New York from Stockholm and Oslo, and from Helsinki on two days of the week.

* * *

There were 27,471 air transport movements at U.K. airports during August, 7.1 per cent more than in August 1951. The number of passengers increased by 17.8 per cent to 467,095, but the amount of freight handled decreased by 29.3 per cent and there was a very slight drop in the amount of mail set down and picked up. Most airports handled more passengers during the month than in August 1951, including the following (percentage increases are shown in parenthesis): London (11), Northolt (7.5), Ronaldsway (43.6), Ringway (48.5), Glasgow (26.7), Prestwick (57.5), Belfast (18.3), Edinburgh (168.1), Jersey (28.4), and Guernsey (26.3).

B.O.A.C. ANNOUNCE the appointment of Mr. B. G. W. Wiggett (right) as manager, Argentine, in succession to Mr. T. G. Waymouth, who is returning to London for special duties on the staff of the general manager (stations and traffic). Mr. Wiggett, who was until recently administration manager (stations), will be responsible for preparing for the introduction of the Avon-Comet on the South American route. He joined the Corporation in 1940 and has spent the greater part of his time overseas.



Biggin Hill, Sunday, with Meteor 8s of a regular squadron scrambling. In the right foreground is a Meteor 8 of No. 600 Squadron, R.Aux.A.F., and on the left of the picture, farther distant, similar aircraft of another famous Auxiliary squadron—No. 615.

ARDENT—THE FIRST PHASE

Largest Defence Exercise Since the War

Illustrated with "Flight" Photographs

LAST week-end saw the first of three phases of Exercise Ardent successfully concluded. This sixth and largest exercise since the war is designed to discover how the defences of the U.K. would stand up to prolonged and heavy air attacks of all kinds. It is the culmination of a long period of training, reorganization and re-equipment designed to make our defences adequate.

The defensive forces comprise regular and Auxiliary fighter squadrons, a wing of the U.S.A.F., a wing of the R.C.A.F., some squadrons of 2nd A.T.A.F. and of the Royal Navy. Aircraft types include Vampires, Meteors, Venoms, Sabres and Sea Hornets.

Attacking with a maximum effort Bomber Command are using Washingtons, Lincolns and Canberras; aircraft of Transport and Training Command (Hastings and Wellingtons); a variety of aircraft from the Royal Navy; B-50s of the U.S.A.F. 7th Air Division; F-84s of the U.S.A.F. 3rd Air Force; and aircraft from General Norstad's Allied Air Forces, Central Europe, including 2nd A.T.A.F., U.S.A.F. 12th Air Force, and French, Belgian and Netherlands units. Certain fighter squadrons are flying Meteors, Vampires, Mosquitoes and F-84s to simulate high-altitude jet bombers, and are also engaged on fighter sweeps.

Large numbers of reservists have volunteered, including members of the R.O.C. and A.A. Commands. In all some 200,000 men are involved, and well over 1,000 aircraft. The Navy are attacking three separate convoys (Northern, Southern and in the Downs) which include H.M.S. *Eagle* and the battleship *Vanguard*. Attacking aircraft are Firebrands and R.N.V.R. Sea Furies, Fireflies and Seafires. Training Command Wellingtons are active as mine-layers.

The first phase opened up with a heavy attack by a medium and heavy bomber force, flying in streams, on Edinburgh, Glasgow and Manchester. Interceptions were made continuously but reaction by the night fighters was somewhat limited by mist and fog over their bases. Weather was good for attacking forces. A diversion planned to draw fighters north was cleverly seen through and in the main it failed.

Dawn attacks followed: the first, 100-plus strong, aimed at Liverpool, was intercepted by day fighter squadrons and progressively engaged by, in all, 250 aircraft until finally the bomber force was considered to have been annihilated on the way out. At the same time a Canberra raid came in at 35,000ft at a different point, with the intention of hitting Birmingham. According to the communiqué these raids were first intercepted when approaching the coast, by new night fighters—assumed to be Venoms. The fighters were alerted on the ground.

Pressure increased with a B-50 raid on London during the morning; this was intercepted and engaged all the way up to Edinburgh on the way out. Convoy raids developed and a big fighter sweep was made by Allied aircraft over the London area at midday.

While this was happening, high-altitude (35,000ft) attacks were made on Eastern bases. These main day raids comprised three large formations of Continental-based R.A.F. fighters used to simulate jet bombers and coming over at 30-minute intervals. Dutch Meteors attacked the North Midlands from top height, and also took part in the London area sweep.

In the early afternoon of Saturday, Vampires based on the Continent tried to attack Norwich from about 35,000ft but were intercepted by Sabres and Venoms.

Within 18 hours of Ardent having started, 1,200 defensive sorties had been flown (most fighters had been up two or more times); 600 offensive sorties had been flown in the daylight period alone. Mines had been sown in the Firth of Forth, Harwich and Solent areas. The medium night bombers dropped practice bombs on Larkhill range during their raids.

One of the highlights of Saturday night was another raid by a small formation of Canberras, this time on Edinburgh and Liverpool. The Secretary of State for Air, Lord De L'Isle and Dudley, flew in one of the machines. This raid was again intercepted by new night fighters (Venoms) before it reached the coast; but at the debriefing the Minister said that he had not seen any night fighters.

The biggest operation of the night was a raid by about 100 Lincoln and Washington medium bombers on Glasgow. On this operation the number of interceptions was much greater than the number of bombers. From Fighter Command's point of view it was considered that practically all the aircraft taking part had been annihilated. The bombers all carried live practice bombs, which were dropped on targets on bombing ranges before the aircraft flew over their target cities.

The third important raid during Saturday night was against York, by another force of medium bombers, at about 0500 hr. There was much spoofing and diversion in the planning of this raid and the night fighters, which had been busy with the Glasgow raid, were not quite so effective.

A feature of Sunday's day raids was the number of low-level attacks on airfield targets in East Anglia. At 0800 hr some U.S.A.F. Thunderjets started the ball rolling and an attack by 50 Vampires of 2nd A.T.A.F. on eastern airfields at 1000 hr was followed by further sorties against an airfield in Cambridgeshire and the R.C.A.F. base at North Luffenham.

Higher-level operations included raids against Glasgow, Liverpool and London by B-50s flying at 25,000-30,000ft. The London attack developed about midday and all the Meteors from Biggin Hill took part in the defence—quite in the best Battle of Britain style.

After lunch an airborne attack was delivered near the mouth of the Humber. It was rather an unreal operation since the three Hastings taking part crossed the whole country, flying without escort. The 100 paratroops involved in the sorties were mostly Territorials. This was the first time paratroops had been used in a Fighter Command exercise.

The first phase of Ardent finished with a low-level raid at 1530 hr on Fighter Command Headquarters by 24 Dutch Thunderjets operating from Holland. Their pinpointing was perfect; they came in over Harrow-on-the-Hill and went out via Elstree and Margate. The defence harassed them all the way from the coast, building up to a climax right over the target, where a dog-fight between the Thunderjets and defending Meteors and Sabres developed.

At 1700 hr the first phase of the exercise was completed. Air Chief Marshal Sir Basil Embry, A.O.C-in-C. Fighter Command, said that he was delighted with the number of interceptions.

Binbrook Canberras

This famous station was of particular importance during the first phase of Ardent, for it was here that the Canberra bombers were based. Each of the Binbrook squadrons contributed to the effort, a number of crews from each unit being detailed for each operation.

For the first time in such an exercise, operational secrecy was applied to the bombers' activities. Such a policy is clearly essential if real lessons are to be learnt, and Binbrook did all it could to deny the fighters any advance knowledge of the Canberras' intentions. The only weakness lay in the fact that each sortie could be followed by radar as it left Binbrook; as a consequence, the attacking forces were routed far out to sea, beyond radar range, and brought in again over a completely different part of the coast. In fact, many hundreds of miles were usually covered before the aircraft could once more be detected from the British Isles.

The first sortie, by a medium force, was airborne before 6 a.m. on the Saturday, bound for an industrial target in Birmingham. One pilot saw a fighter after sun-up, but no other defence activity was reported. The day dawned windy and cloudy and three aircraft were diverted—two to Waddington and one to Valley—to return after breakfast.

The next, and major, operation was a night attack on a Liverpool target. By about 5.30 p.m. the various briefings had been completed and about 40 minutes later two Devons arrived, one bringing Lord De L'Isle and Dudley, V.C., Secretary of State for Air. The pilot of this aircraft—Air Chief Marshal Sir Hugh P. Lloyd, A.O.C.-in-C. Bomber Command—appeared well pleased with his command in general and Binbrook in particular; but he could not stay, and was airborne again within a few minutes. The Secretary of State, however, had come to see things working at first hand, and had arranged to fly on the imminent sortie.

One of the flight commanders was airborne by 7.35 p.m.—by which time it was pitch dark—to act as a form of pathfinder; the main force followed some ten minutes later. One aircraft had to return after a few minutes, but the remainder enjoyed a beautiful, clear night; and to add to the splendour, a particularly brilliant display of the Northern Lights appeared when the aircraft reached high latitudes. Again no opposition was seen—which does not necessarily imply a lack of interceptions—and the force was back at the appointed hour, landing at commendably frequent intervals. And a stirring scene it was as we saw it from the downwind end of the runway in the yellow glare of the sodiums—the sinister shapes squelching on to the tarmac, leaving behind a warm wind heavy with paraffin.

Discussing the sortie later it was evident that the Secretary of State had enjoyed himself greatly, notwithstanding his choice of "the most occasional of the Canberra's seats" up alongside the pilot, S/L. A. W. Southall, D.S.O., D.F.C., A.F.C., one of the squadron commanders. At one time, he said, nearly the whole of Scotland could be seen clearly; and he found the Canberra surprisingly quiet and smooth.

The final Binbrook effort was a photographic reconnaissance carried out by a small force, the leading aircraft being flown by G/C. N. C. Hyde, the station commander. Each Canberra flew the same series of legs up to a specified point, and then selected an individual course, to cross the coast alone and make for its own selected target. A luxury—as W/C. "Pat" Connolly, D.F.C., A.F.M., put it—was the "airborne reserve" procedure adopted on this sortie. A reserve, briefed for the occasion, followed the P.R. aircraft to 20,000ft; if by this time no one had turned back, the "airborne reserve" cruised gently back to Binbrook. Such a procedure is essential if a reserve is to be used at all, for if one Canberra takes off and its reserve is left on the ground the reserve cannot fit into the operation at all.

Although, understandably, no attempt at an analysis of the work done can yet be attempted, we may express the view—unanimous at Binbrook—that, when the Canberra is efficiently operated, very very few fighters can make an effective attack on it, or even get near it. And it was rather galling to the crews involved when one strike was briefed to fly some ten to fifteen thousand feet below the optimum—just to give the fighters a chance, as one spokesman put it.

W. T. G.

Waterbeach Meteors

"Well," announced F/S. Jack Crowther, as he swung our Meteor 7 on to the runway last Saturday afternoon and hared after a receding stream of Mk 8s, "here we go."

Our machine displayed the yellow and black chequer-boards of one of the day interceptor squadrons based on Waterbeach, which sprawling Cambridgeshire base is commanded by G/C A. H. Donaldson, D.S.O., D.F.C., A.F.C., and has as its wing commander flying P. P. C. Barthropp, D.F.C., whom we remembered from his Boscombe days.

We had found the wing commander early that morning in the dilapidated, fuggy dispersal hut with his pilots—all toting their 38s in rakishly slung holsters, smoking and ragging, and occasionally glancing through the grimy windows at the heavy Fenland mists. There we waited until the sun began to fight through, and the morning was well advanced before we saw 14 Meteors brought from readiness to standby. Close-packed, they stood glinting in the strengthening sun till suddenly we heard the Derwents begin to sing, hum, rumble and scream, and, two by two, the fighters went scurrying up the runway. Within seconds there remained only a knot of rifle-slung ground crew with their trolley-accs. in a wake of kerosine haze. Two Alsatians romped unheedingly, and with them we passed an hour in the sun till the Meteors came streaming in again and we joined their tousled pilots at debriefing.

From 34,000ft it emerged they had spotted the raiders—ten Vampire "bombers"—10,000ft below them on the port quarter; whereupon the wing commander had told them to get in and pitch. And though his views on certain aspects of the proceedings were not altogether complimentary, he did allow that some "pretty reasonable" attacks had been made.

While we had waited a suppressed roar from behind the hut had set us scanning the horizon for rats; but we had traced its source to the pressure stoves, where at we now fell into line before a steak and kidney pie of transcendent size and succulence. The tablespoon which the wing commander managed to win for us is an ideal tool to negotiate the boulders of kidney, and having dispatched our helping we felt ready for anything—even Canberras.

For the sortie, which, we were assured, could hardly fail to materialize that afternoon, we had a parachute already stowed in the Meteor 7; so when standby was eventually called we were quickly out of a Land Rover, into the cockpit, strapped in, plugged in, and shut in. Our Mk. 7 charged out from dispersal, fell into line, stood there poised for a minute or so—and taxied back. The squadron's state had been reduced to readiness. But this Grand-Old-Duke-of-York business is just part of the game and is reckoned to be much easier on the anatomy than prolonged sitting on a parachute pack.

We just had time to light a cigarette when someone yelled "Scramble!" and, the Land Rover having already careered away, we had to leg it back to the Meteor. We were still panting as we taxied round the perimeter track, and almost immediately we heard F/S. Crowther's assurance that we were, at last, away.

Our Meteor was one of 16 drawn from two squadrons, commanded by S/L. F. W. Doherty and S/L. R. J. F. Spooner. As

(*This first report on Ardent is concluded on page 492.*)

The Secretary of State for Air arrived at Binbrook on the evening of Saturday, October 4th; he is seen (left) being welcomed by the station commander, G/C. N. C. Hyde. The Binbrook ground crews were kept busy over the week-end; Canberra fuelling (right) was a major task.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Supersonic Phenomena

WHEN the late John Derry dived the D.H.110 through Mach 1 over Farnborough on September 6th many people, in addition to hearing the two loud reports, saw two white puffs form in the track of the aircraft, billowing out into two sizeable clouds. Their timing appeared to confirm that they were visible evidence of the "sonic explosions."

My own reaction was, at first, to consider the possibility that they may have had some kind of thermodynamic origin, i.e., that they consisted of smoke and that the explosions were in some way a result of hot jet efflux, containing unburnt fuel oil, which, entering the pressure wave, exploded at the critical point.

There is more probability in my second theory: when the aircraft attains Mach 1 the pressure-wave is left behind. This results in a sudden reduction of pressure, and condensation occurs. Presumably, when the aircraft decelerates to subsonic speed the process is repeated, hence the second "cloud" and "bang." But if this is the case then it would appear that both Derry and Neville Duke were "through the barrier" for barely one second!

Folkestone, Kent. S. U. JORDAN.

MAY I take this opportunity to enlarge upon two false impressions? (1) The "sonic barrier" is not so much a barrier as a line of demarcation: it can be likened to the Scottish border, in that considerable differences become evident as one crosses it, but not, in general, suddenly. The main point is that a shock-wave cannot be formed at less than the speed of sound. (2) A single shock-wave will not produce a "bang" in the ears of an observer, especially if it is the weak wave produced at M = 1.

The "sonic bang" is easily explicable as follows. An aircraft flying near M = 1 will accelerate very slowly, since it has very little spare thrust. Thus, just as it reaches Mach 1 the little extra drag due to the weak shock-wave formed will be enough to slow the aircraft *just* below Mach 1 again. With the reduced drag now existing, a small acceleration again follows. This may be repeated several times, so that a considerable number of weak shock-waves is formed, each one radiating *from the place at which it was formed*, at the speed of sound. Now, in effect, the first "wavelet" made by the aircraft will still be flying alongside when the last one is made, so that the forward-moving waves will all be "in line abreast," and a listener directly in front of the aircraft at the sonic instant will hear a high-pitched crack.

On this basis, if the aeroplane makes a number of waves over a period of, say, t seconds, then an observer in front of the aircraft hears them all at once, and an observer at any angle θ to the side will hear the waves in a space of $t(1-\cos\theta)$ sec. This means that the sound will rapidly lower in pitch to a "boom," and eventually, as the angle increases, to a sound too low-pitched to be noticed.

This theory can easily be tested, because the following inferences follow from it:—

(a) The *pitch* of the sound heard becomes lower as the angle from the path increases.

(b) No bang will be produced while the aircraft is supersonic (although it will then be making a stronger shock-wave!).

(c) A bang will be heard whenever the aircraft "scrapes" the speed of sound.

(d) No bang need be produced at all if the aircraft accelerates *rapidly* through M = 1.

A succession of shock-waves may also be produced by flying at an "average sonic speed" through air of slightly varying temperature.

Pyrford, Surrey. C. BORE.

Old Airmen Never Die

IN my article "Selecting a Military Aircraft" in your issue of August 1st last, I mentioned, in a list of competing pilots who are still living, that Harry Busteed may be living in Australia, though I had not heard of him for many years.

This has brought me a letter from him to say he is now retired with the rank of air commodore and living in Cornwall. He gives amusing reminiscences of the Bristol monoplanes he flew in the Military Trials.

London, S.W.3. GEOFFREY DORMAN.

[Mr. Dorman has passed on A. Cdre. Busteed's letter. We print the major portion here.—ED.]

"I remember the whole show very well and I think it ate up a fair amount of nervous energy that I could have done with at a later date. Bristols, of course, entered four aircraft, two monoplanes designed by Sam Coanda and two biplanes designed by Barnwell and G. England. England and Pixton were to handle biplanes and Valentine and myself monoplanes.

"I was more or less the test pilot in those days, and it fell to me to do the initial testing. The biplanes were badly underpowered and were ruled out. The monoplanes suffered from Sam Coanda's artistic temperament, to the detriment of their technical qualities. Anyway, I distinctly remember that the aeroplane flew me and not I it; and, after practically refusing to do anything further, I ultimately got a larger rudder and fin. Then Valentine came in, but hated it, so slung his hand in; and Pixton, being spare, took over his aircraft—which was a good thing, as he hadn't a very enquiring mind.

"However, we carried on with the trials. My little worry was that after every flight the wing bracing required adjustment. I remember clearly after flying for any length of time saying to myself, 'surely the sag in the top bracing wire allowed it to rest on the first rib outboard from the fitting; now it is the second.' Sure enough, on coming in, the cables could be tightened. Stretch! Anyway, at the finish of the trials I decided to have no more to do with that aircraft and said so.

"However, Hotchkiss (who was detailed to go on R.F.C. manœuvres later) came along and said he wanted my aircraft as he liked the look of it. I did my best to persuade him to get some other, but he persisted in flying it to see what he thought of it. He went off with it and, as you remember, crashed with Bettington at Port Meadow near Oxford.

"I was away on some other work at Cowes—I think testing a seaplane—and didn't touch a monoplane of this type until my return to the Plain later. In the meantime, I think young England, G.'s brother, was killed in one. Anyway, I returned to commence testing for the forthcoming Italian Military Trials, which called for an increased load. I started, and there before my eyes was the top bracing business all over again, except in this case it happened quickly and took in three ribs; so down I came to tighten up and off again, each time naturally getting somewhat more anxious.

"Well, to cut a long story short, I was sitting on the floor of the hangar with the side view of the aircraft in front of me, feeling somewhat annoyed with the whole business, when my eye caught something unfamiliar and unsymmetrical. The bottom cabane, which carried the rear-spar load cables, was not at the same angle relative to the chassis struts at which my eye had become accustomed to see it. I promptly got up and, sitting down under the aircraft, took the end of each chassis skid in each hand with my foot against the cabane, pressed forward with my foot and lo! it went forward about 6in; the dear thing was getting ready to fold up against the belly of the aircraft and write me off!"

FORTHCOMING EVENTS

Oct.	13.	Woman's Engineering Society: "Meteorology and the Engineer" (lecturer to be announced).
Oct.	15.	Aircraft Recognition Society: Second 1952-3 Meeting and contests.
Oct.	16.	Institute of Welding (South London Branch): "New Ideas on the Welding of Aluminium," by P. T. Houldcroft.
Oct.	17.	Institute of Navigation: Annual General Meeting, and Presidential Address by Rear Admiral A. Day, C.B., C.B.E., D.S.O.
Oct.	25.	S.L.A.E.: Film Show.
Oct.	28.	Aircraft Recognition Society (Plymouth Branch): Second 1952-3 Lecture Meeting and Recognition Contest.
Nov.	7.	Helicopter Association: "Operational Future of the Helicopter," by P. G. Masefield, M.A.(Eng.), F.R.Ae.S.
Nov.	8.	British Interplanetary Society: "Evolution of Life in the Universe," by Prof. J. D. Bernal, F.R.S.
Nov.	12.	Institute of Transport: Anniversary Luncheon.
No.	19.	Royal United Service Institution: "The 'Bismarck' Operation in the Light of German Records," by Cdr. R. F. Jessel, D.S.O., D.F.C., R.N.
Nov.	21.	Institute of Navigation: "The Vertical Reference in Navigation," by W. A. W. Fox and D. Barnett.
Nov.	25.	Society of Instrument Technology: Symposium on "Control Valves." Papers by A. R. Aikman, B.Sc., H. R. Walton, B.Sc., A.M.I.Mech.E., and B. W. Balls, B.Sc., A.M.I.Chem.E.
Nov.	29.	S.L.A.E.: "The Bristol Proteus Gas Turbine," by D. Dekkars.
Dec.	3.	Royal United Service Institution: "The Air Battle," by Air Chief Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Dec.	5.	Helicopter Association: "Simulation of Flight Loads by Ground Tests," by M. J. Brennan, B.Sc., and R. Hafner.
Dec.	13.	British Interplanetary Society: "Guidance and Control of Missiles," by J. Humphries, B.Sc.(Eng.), A.M.I.Mech.E., A.F.R.Ae.S.
Feb.	9.	Institute of Transport: Brancker Memorial Lecture: "The Influence of Military Aviation on Civil Air Transport," by Sir Frederick Handley Page, C.B.E.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

Tour by New C.A.S.

BEFORE taking up his appointment as Chief of the Air Staff next January, Air Chief Marshal Sir William F. Dickson is making a world tour of air bases. His itinerary will include R.A.F. stations in the Middle and Far East, Pakistan, India, Indonesia, Australia, New Zealand, Canada and the United States.

Sir William was due to leave London Airport at midnight yesterday in a Transport Command Hastings.

Delta Training

A NUMBER of R.A.F. pilots have already been checked out on the Gloster Javelin delta-wing all-weather fighter, and others will eventually train in the special side-by-side two-seater developments of the Avro 707A research aircraft.

Director of Weapons

AFTER a tour of duty as a sector commander in Fighter Command, A. Cdre. K. B. B. Cross, C.B.E., D.S.O., D.F.C., has been appointed Director of Weapons at the Air Ministry.

A. Cdre. Cross is one of the few survivors of the aircraft carrier H.M.S. *Glorious*, sunk by enemy action off the coast of Norway in 1940. In April of that year the Hurricanes of No. 46 Squadron took off under his command from the carrier for the Norwegian campaign and, after covering the evacuation of the Allied land forces from Narvik, flew back to the carrier and landed on its deck. This was the first time that Hurricanes had taken off from or landed on an aircraft carrier. Within a few hours of the squadron's return H.M.S. *Glorious* was attacked by the German battle cruisers *Scharnhorst* and *Gneisenau* and sunk. S/L. Cross (as he then was) jumped overboard and climbed on to a raft, and with six others was picked up three days later by a Norwegian tramp steamer.

PIPING THE STILL: Hands fall in and line the ship as H.M.S. 'Eagle' enters Oslo harbour at the conclusion of Exercise Mainbrace. The Attackers in the foreground belong to Nos. 800 and 803 Squadrons and ranged behind the Skyraiders are the Blackburn Firebrands of No. 827 Squadron.

Australian Vampire Trainers

THE Australian Minister for Defence Production, Mr. Eric Harrison, told a questioner in the House of Representatives last week that the first line of D.H.115 Vampire Trainers for the R.A.A.F. had been established on schedule. Machines now leaving the line are ahead of schedule.

Two Appointments

UNTIL recently commander of the Metropolitan Sector of Fighter Command, A. Cdre. R. B. Lees, C.B., C.B.E., D.F.C., has now gone to Germany to become A.O.C. No. 83 Group, 2nd T.A.F. Before becoming a sector commander, A. Cdre. Lees was Group Captain (Operations) at Fighter Command.

A second appointment is that of A. Cdre. D. R. Evans, C.B.E., D.F.C., to the post of Director of Operation Requirements (B), at the Air Ministry. A. Cdre. Evans has been on the directing staff of the Joint Services Staff College.

Exchange Visit

ON Thursday of last week six Shackletons of No. 269 Squadron, R.A.F., left Britain for Canada to take part in maritime exercise Emigrant, which had been planned by SACLANT to take advantage of the disposition of forces returning from the recent maritime exercise Mainbrace.

The visit is an exchange for that of the Canadian squadron, No. 404, which came to Britain in June for exercise Castanets. The Shackletons are due to return on October 20th.

Australian A.D.C.'s

TWO Regular Australian air force officers and one R.A.A.F. Reserve officer have been appointed air aides-de-camp to the Queen. They are: A. Cdre. W. Lloyd Hely, A.F.C., who is at present A.O.C. Western Area; G/C. C. T. Hannah, O.B.E., Director of Personal Services, and W/C. R. Kingsford-Smith, D.S.O., D.F.C., who is a member of the de Havilland Company in Sydney and Commandant of the Air Training Corps in New South Wales.

Para-rescue and Survival Training

THE R.C.A.F. Para-rescue School and the Survival Training School are being amalgamated at Edmonton under F/L. S. Alexander, who is an expert on matters appertaining to life under arctic conditions. F/L. C. W. Weir, who has hitherto commanded the Para-Rescue School, is returning to flying duties with No. 408 P.R. Squadron.

A Popular Station

THE silver cup awarded to the R.A.F. Station in Britain with the best airmen's mess has been won by Leeming, Yorkshire. Mr. George Ward, the Under Secretary of State for Air, flew to the station last Friday to present the cup. The W.R.A.F. must look to their laurels because Leeming is boasting that it is served by an all-male cookhouse staff.

KING FEISAL OF IRAQ is introduced to the pilots of No. 54 Squadron by the Commanding Officer, S/L. J. Kelly, D.F.C., during a recent visit to Odiham. On the left is W/C. D. Crowley-Milling (Wing Commander Flying).

ARDENT—THE FIRST PHASE . . . (Continued from page 489)

the autumn fields dropped below we closed formation and the altimeter went winding round as we maintained our battle climb. At 5,000ft we were above the strato-cumulus; at 10,000 a small amount of alto-cumulus was left behind; at 20,000 the flight sergeant turned on the cockpit heater; at 30,000 we saw distantly a few banks of cirrus and cirro-cumulus; and at 33,000 we levelled out. We had turned our oxygen full on at take-off and, though unpressurized, were quite reasonably comfortable, if chilly. As our formation was vectored on to various headings, the other Meteors showed up like slivers of silver or in dark silhouette. But there was no enemy.

We descended to 31,000 and various items of advice and instruction came over the R/T. regarding headings and targets. In particular we heard mention of a formation of 20-odd Vampires. But something had gone amiss. Language went from warm to profane. Someone's fighting efficiency and personal composure suffered a simultaneous setback when his gun-sight suddenly landed in his lap. As for ourselves, we could only watch the Meteor next door streaming its contrails, with the deep blue above us and the sun-flooded carpet of cloud below. At length the Meteor's nose dipped, the dive brakes flipped out, and we dropped to homelier levels through a breach in the cloud.

We had failed to intercept. H. F. K.

Coningsby Washingtons

From Coningsby, Lincs, a strong force of Bomber Command Washingtons, comprising four squadrons, was operating. Led by G/C. G. A. Walker, the station C.O., the force was able to put to good use its knowledge of modern tactics in aerial bombing. During the first two nights of the exercise, medium-height attacks were made on six targets, five of which were important Northern towns and one a pinpoint on a regular bombing range (for practice with live bombs). Liverpool, Manchester and Grangemouth were the first night's targets; Glasgow and York the following night's. A number of interceptions by fighters were reported.

The planning, execution and assessment of the operations, which we were privileged to see in all stages, emphasized the thoroughness with which, of necessity, Bomber Command tackle such jobs. Many hours of preparation were required for the specialist and general briefings preparatory to flight, especially so for the information given to navigators and bomb-aimers to assist in recognizing the target by radar. Concerning the second factor above—execution—we were able to make a comparatively short (six-hour) flight in a Washington on one operation, about which we hope to say more next week.

The immediate assessment of the attacks comes, of course, at the debriefing, directly following the landing. The Ardent Washington crews, in general, were pleased with the accuracy of their own bombing attacks, dubious concerning the complete effectiveness of the opposing fighters (Meteor N.F.11s, Venoms, and Vampires were all reported), and very pleasantly surprised by the weather (there was general wonder, too, at meeting over the North Sea the exact conditions forecast by Met. for that area). For impartial confirmation of the bombing accuracy, we examined radar PPI photographs of the previous night's attack—and confirmation there certainly was.

Serviceability over the two nights' operations had been good, said G/C. Walker; only one aircraft—with an engine fault—had returned before time. In spite of the interceptions made, the crews pointed out that they had generally been intercepted *after* passing over the target.

The 10-man crews had each flown together for many months, and were veterans of Mainbrace, Pinnacle and other exercises (and, in many cases, of the last war). Also flying were seven R.A.F.V.R. aircrew, whose 14-day training coincided with Ardent; and Captain H. H. Vaughan, U.S.A.F., had been an "exchange scheme" navigator with one of the crews for some time. In addition, one of the ops. room intelligence officers proved to be on annual V.R. training, and sadly neglecting his North Wales solicitor's practice the while. K. T. O.

Clambering swerve: a snappy scramble from North Luffenham by an F-86E of No. 441 (Silver Fox) Squadron.

North Luffenham Sabres

It might have been a real war, so tight was the grip of security at North Luffenham (base of No. 1 Fighter Wing, R.C.A.F.). Stalwart airmen barred the station roads at every corner, demanding from the writer in polite but firm Canadian accents: "I-card, please." With the aid of an Air Ministry pass and the friendly guidance of F/O. J. M. Nelligan, we safely negotiated a dozen check-points and emerged upon the airfield. Three squadrons of Sabres were standing at readiness, autumn sunlight casting a golden glint on the knife-edges of swept-back wings and tails.

Pilots of No. 439 (Tiger) Squadron were seated in their cockpits, ready to start up their J-47 turbojets, taxi out and take-off in pairs within 4-5 min of receiving the R/T order "Scramble." The only sound was a steady buzz from the yellow-painted energizer trollies plugged into each aircraft (the demands of electrical instruments and radio would prove too great for the internal batteries over a long "standby" period). Blackboard instructions in the empty pilots' room added to the operational atmosphere: "No eating in the officers' mess . . . Pilots, keep away from operations room . . . Bale-out bottles for every flight. . . ."

While the Tigers took off, we made our way *via* perimeter-track to the dispersal point of No. 410 (Cougar) Squadron, whose pilots provided a cheery welcome and some news of the progress of the exercise. Their task was to intercept raiders at any time between dawn and dusk—plus an hour at each end of the daylight scale. Since briefing, at 5 a.m. that morning, the Squadron had flown three missions, each of 40-50 minutes, of which two had resulted in successful interception of Lincolns and Meteor P.R.10s. On the other occasion their quarry had turned back before the Sabres made contact.

No details of battle-tactics could be divulged, but the pilots were of one mind as to the ability of their Canadair-built F-86Es to engage and shoot down any aircraft likely to attack this country. Underwing tanks had been removed, presumably to improve climb performance, and the 410 Squadron pilots had met their targets "somewhere between the East Coast and Holland" (cloud had prevented more precise location of the battle-zone).

A much-publicized feature of the Sabre is its ability to exceed the speed of sound in a dive. Supersonic bangs, however, should not be heard during Exercise *Ardent*, as speeds of M—0.95 are likely to be the maximum attained by the F-86 while acting as an intercepter. The supersonic dive, we gathered, was an effective manœuvre in escape rather than in pursuit. R. B.

Biggin Hill Meteors

On Saturday morning the day fighters were all set for the exercise by first light. The pilots of No. 600 and 615 Squadrons, R.Aux.A.F. stayed at the airfield overnight and the Auxiliary ground crews had arrived by special early transport. Weather at first was dull and misty but cleared later to a fine afternoon with cumulus clouds. A.V-M. the Earl of Bandon, A.O.C. No. 11 Group flew in from Bovingdon in his Vampire and later departed for Odiham.

Sorties consisted mostly of flying off in pairs to make high-level and low-level interceptions or to provide standing patrols over a six-vessel convoy near Folkestone. One pair from No. 615, while over this convoy, had an exciting time coping with a number of Naval aircraft, including Seafires, Fireflies and Firefly Trainers.

Just before 1700 hr there was a considerable dog-fight going on a few miles south-west of Biggin Hill where some 12 Meteors were dealing with a low-level attack.

Sunday morning broke still and bright and the first excitement was a wing scramble for a fighter sweep which extended from Southend to Ostend and Walcheren, up the North Sea and back to Biggin Hill. Nothing was seen, however, except a lot of contrails, some Sabres and another wing of Meteors.

Another wing scramble came during mid-morning. The speed at which the Meteors got away was very impressive. One minute the airfield seemed full of resting aircraft and then, after a rush of trolley-accs. and pulling-away of chocks it suddenly appeared empty—while from above came the drone of high-flying aircraft. The best individual pair starting from an operational readiness platform were from a regular Meteor squadron. They were both airborne in 28 seconds after the brown alarm puff had been fired.

An air of unreality came with the passing over Biggin Hill at rather less than 1,500ft (because of the London Control Zone) of three "enemy" Hastings carrying paratroops to commit sabotage in Yorkshire. They went their way unharmed—nice juicy game, with a charmed life.

The final big excitement before the closing down of the first phase was the scramble to protect Fighter Command Headquarters from the attentions of the Dutch Thunderiets. With a proper sense of its own importance Fighter Command put in all it had available—although much of the force arrived after the visitors from Holland had departed. J. Y.

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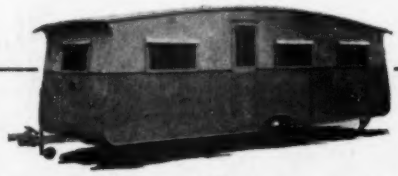

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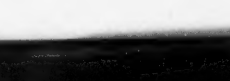

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Application No. 59, from Airwork, Ltd., of 15, Chesterfield Street, London, W.1, for a normal scheduled service with Viking (VC1) aircraft for the carriage of passengers, supplementary freight and mail between London (Blackbushe) and Naples (Capodichino) at an initial frequency of from one to seven services weekly during the period fro n Nove mber 1st, 1952, to October 31, 1953.

FROM Manx Air Charters, Ltd., of Ronaldsway Airport, Ballasalla, Isle of Man:—

Application No. 63. For a U.K. internal seasonal service with D.H.89A Aircraft for the carriage of passengers and supplementary freight between Isle of Man (Ronaldsway) and Carlisle (Kingstown) at an initial frequency of from three to 10 services at week-ends during the period from May 31st, 1953, to May 30th, 1960.

Application No. 61. For a U.K. internal seasonal service with D.H.89A aircraft for the carriage of passengers and supplementary freight between Isle of Man (Ronaldsway) and Newcastle (Woolsington) at an initial frequency of from three to 13 services at week-ends during the period from May 31st, 1953, to May 30, 1960.

FROM British Overseas Airways Corporation, of Airways House, Bressiter, Middlesex:—

Application No. 62. For a normal scheduled service with Hermes and later Bristol Britannia aircraft for the carriage of passengers, supplementary freight and mail between London Airport and Lusaka (N. Rhodesia) and Salisbury (S. Rhodesia) when airport available with intermediate traffic stops at Rome or other points in Burope, Cairo, Khartoum, Entebbe and Nairobi, at an initial frequency of from one to two services weekly during the period from December 2nd, 1952, to December 1st, 1959.

Application No. 60. For a traffic stop at Mantia, alternative to Hong Kong, on their existing normal scheduled service between London Airport and Tokyo for the period from April, 1953, to March, 1959.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their reasons for not readily permitted to the Council, must reach them within the period allowed for the making of representations or objections. [9754

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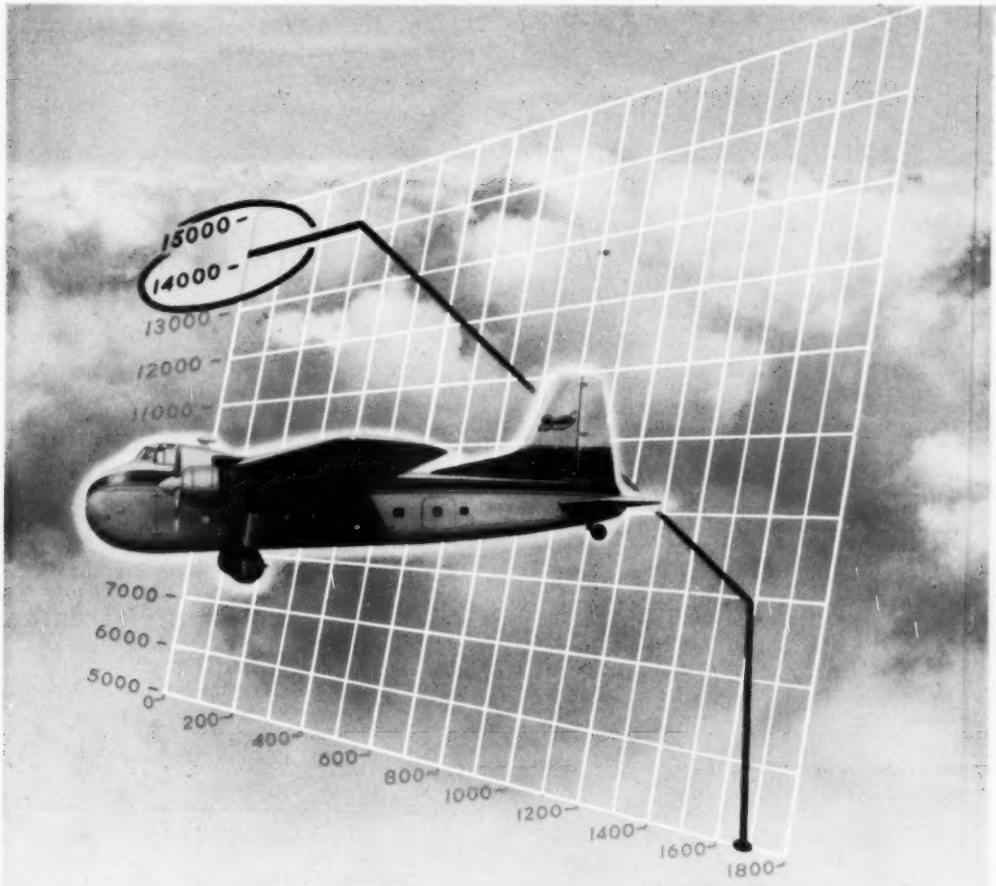

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